МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ХАРЧОВИХ ТЕХНОЛОГІЙ

Н.Д.ТКАЧЕНКО
О.П.АВРАМЕНКО

АНГЛІЙСЬКА МОВА

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Посібник складається з 16 уроків, кожний з яких поділений на дві частини. Кожна частина містить оригінальний текст зі спеціальності “Біотехнологія.” Перша частина включає також активний словник, текстові, лексичні, граматичні та комунікативні вправи для розвитку усного та письмового мовлення. Друга частина містить лексичні та комунікативні завдання. Книга містить ілюстрації.

Посібник пов’язує розвиток навичок перекладу з орієнтацією на зв’язне наукове мовлення.

Посібник розрахований на студентів та аспірантів вищих учбових закладів харчової промисловості за напрямом 6.050401 “Біотехнологія".

Н.Д.ТКАЧЕНКО

О.П.АВРАМЕНКО

ЗАГАЛЬНІ ВІДОМОСТІ

Інтеграція України у Болонський процес з метою універсалізації підготовки висококваліфікованих спеціалістів у вищій школі вимагає підвищення рівня володіння іноземною мовою.

Біотехнологія належить до провідних та найбільш перспективних наук XXI сторіччя, оскільки вона відповідає реальним потребам промисловості та ринку. Оволодіння іноземною мовою на матеріалі біотехнології на молодших курсах являє собою засобом синтезу міжрівневого навчання зі спеціальності, дозволяє своєчасно ознайомитися з новими технологіями та відкриттями в науці і техниці, сприяє встановленню контактів з зарубіжними фірмами та підприємствами.

Посібник розрахований на аспірантів та студентів денної форми навчання технологічних факультетів вищих учбових закладів харчової промисловості. Посібник спрямований на розвиток усіх видів мовленнєвої діяльності: навичок спілкування, самостійного читання та перекладу оригінальної літератури за напрямом “Біотехнологія” з метою отримання інформації з іноземних джерел. Посібник має за мету вивести студентів на рівень B2 згідно Загальноєвропейських Рекомендацій з мовної освіти та Програми з англійської мови для професійного спілкування Британської Ради від 2005 р.

Для досягнення цієї мети посібник містить оригінальний текстовий матеріал, вправи для розвитку навичок оволодіння системою та структурою англійської мови методами лінгвістичних операцій. Граматичний матеріал поданий в моделях, таблицях.

Посібник складається з 16 уроків, таблиць, малюнків. Посібник передбачає усне та письмове опрацювання матеріалу на практичних заняттях та домашні завдання. Посібник розрахований на 1 рік навчання.

Автори висловлюють подяку кафедрі біотехнології факультету цукристих речовин НУХТ за цінні поради та матеріали.

LESSON 1

Verb Tenses. Active Voice.

Present, Past Participle

Part I

1. Read and memorize the following words and word combinations.

improve	поліпшувати
treatment, processing	обробка, лікування
waste disposal	використання відходів
transfer	переносити
advance, advent	прогрес
harmless	нешкідливий
insert	вводити
nucleus	ядро
compartment	відділення
prevent	запобігати
blueprints	інформація
selective permeability	вибіркова проникненість
similarity	схожість
distinguish	відрізняти
embedded	вбудований
subcellular	підклітинний
interlinked	взаємозв'язаний
rigid	міцний
swell	набрякати
burst	тут луснути
store	зберігати, накопичувати
multiply	розмножуватися
precursor	попередник
response	реакція

2. Learn the plural of the Latin nouns.

algae, analysis – analyses, bacilla – bacilli, bacterium – bacteria, formula – formulae, fungus – fungi, genus – genera, nucleus – nuclei, phenomenon – phenomena, protozoa, spirilla, species – specii, virus – viri.

3. Find the international words in the text and give their Ukrainian analogues.

4. Form the nouns with the suffixes: -tion,-sion, -ism, -ose, -sis, -ing, -stry.

contribute, biochemical, photosynthetic, metabolic, process, reduce, destroy, contract, inform, contribute, synthetic, catabolic, anabolic, ferment, organ, product, analyze, possess, solve, fundamental.

5. Form the words with the prefixes: semi-, in-, inter-, intra-, extra-, con- , com-, trans-, pro- .

permeable, organic, synthetic, cellular, action, ability, inscription, link, molecular, amination.

6. Read, translate, retell the text and express your opinion on the achievements of biotechnology.

Biotechnology

Biotechnology was created on the crosslinks of botany, molecular chemistry and genetic engineering. It is known to be the science devoted to developing and improving those industrial and agricultural processes that make use of biological systems. Its task is obtaining microorganisms and products of their life activity with the given properties by microbial synhesis. The techniques used involve the selective breeding of plants, animals, and microorganisms, and the transfer of specific genes from one species to another. Although the field of biotechnology includes areas as diverse

as food processing, waste disposal, and mining, some of its most significant contributions have been in food production and in medicine. Many processes associated with biotechnology center around the use of recombinant DNA.

Food production involves not only the quantity of food produced but also the need for united form quality. In the case of plants, It was discovered that one variety of potatoes grown in the Andes Mountains produces the chemical compound leptine that repels the Colorado potato beetle. When cells from this variety are grown in tissue culture along with cells from commercial potato plants, the cells from the two types of plants fuse and recreate in plants.

In the case of animals, where each female can produce only a limited number of offspring, not only is the quantity produced important but also the uniform quality of the product (milk,meat, wool, and so forth). A technique was devised whereby such union formity can be achieved. The cells of an embryo are derived from a fertilized egg by mitotic cell k.D. division. This type of cell division produces genetically identical cells. If one takes each cell of an early embryo (usually the 16- to 32-cell stage) and injects it into a separate egg-forming cell (oocyte) from which the nucleus has previously been removed, in effect one will have produced the equivalent of multiple "genetically identical" fertilized eggs. Implantation of these embryos into foster mothers will then produce "genetically identical" sheep, cattle, pigs, goats, for example.

A tremendous advance in medical treatment was achieved with the development of the technique for inserting and deleting specific genes in various organisms. Scientists at one biotechnology company were able to take certain human genes and insert them into the bacterium *Escherichia coli.* In the bacterium the human genes produce the same chemical compounds as they would in the human body. Although each bacterium produces only a small amount of a particular compound, by culturing

billions of bacteria an unlimited quantity of the compounds can be extracted from their cells. In this fashion, human insulin was produced for the control of blood-sugar levels in diabetics. Human growth hormone was produced in the same war to be used by children sufferring from retarded physical development. And in time, tissue plasminogen activator (TPA), a naturally occurring enzyme that dissolves blood clots, became available for patients who had suffered heart attacks. Immunization against infectious diseases has been practiced for a long time. However, the need to use the entire disease-causing organism as the vaccine limited its use in many cases.

With the advent of genetic engineering, research has concentrated on identifying those surface proteins (immunogenic proteins) that stimulate the immune reaction. This is followed by taking the genes that produce the immunogenic proteins and transfering them into a harmless bacterium or virus, which can then serve as the vaccinating agent. Using this technique, three different genes — one from hepatitis B virus, one from herpes simplex virus, and one from influenza virus — were inserted into a harmless cowpox (vaccinia) virus. A similar effort has been mounted to produce a vaccine against the human immunodeficiency virus (HIV), which causes AIDS (acquired immune deficiency syndrome).

7. Finish the sentences to describe the text content.

1. The subject-matter of the text is ____ 2. The author says that (dwells upon) ____ 3. He points out that ____4. The author emphasises that ____. 5. The author goes on saying that ____6. The author also discusses (mentions, throws light upon, considers the problem of, raises the question of, accounts on, writes, speaks, tells about) ____ 7. The author concludes with the statement that ____.

8. Answer the following questions.

1. What is the object of biotechnology? 2. Is biothechnology using

chemical or physical methods? 3. What areas does biotechnology include? 4. Do biotechnological processes center around the use of recombinant DNA? 5. Are biotechnological methods used in food production? 6. How is uniform quantiy in plants achieved? 8. Genetic engineering made a great contribution into medicine, didn't it? 9.What has research concentrated on with the advent of genetic engineering?

9. Ask your own questions of different kinds on the text.

10. Write the plan of the text, entitling the paragraphs.

11. Find in the text the following word combinations and translate them into Ukrainian.

basic structural units, currently existing organisms, vast biochemical diversity, carry out, mechanical injury, bacterial shapes, composed of, lacks a nucleus, performs several vital functions, referred to as, prevented from leaking out, stores the cell's information, found within the nucleus, component of ribosomes, improving agricultural prosesses, involve the selective breeding, transfer of genes, food processing, wastes disposal, significant contribution, tissue culture, number of offsprings, insect pest, tissue-resistant strain, food supply, in this fashion, with the advent of, medical treatment, insert / delete gene, foster mother, dissolve blood clots, become available, disease-causing organism.

12. Find in the text the English equivalents of the following Ukrainian word combinations.

існуючі організми, різноманітність видів, джерело їжї, виконувати різні фукнції, відділ клітини, підтримувати форму, походити від, впливати на, запобігати чомусь, переносити інформацію, додаткові молекули, привносити переваги, зберігати інформацію, присвячена розвитку, поліпшувати промисловий процес, обробка їжі (2), перенос

генів, значний внесок, тканева культура, використання відходів, постачання їжі, видалити ген, запліднена особина, включати селективне вирощування, розчиняти згустки крові, різноманітні галузі, хімічна сполука, нешкідлива бактерія, якість продукту.

13. Fill in the gaps.

transfer, quality, inserting, protection, derived, obtaining, deleting, cell, processing, breeding, disposal, improving, involve, injected, division, quantity.

Biotechnology is devoted to developing and ____ industrial and agricultural processes. Its task is ____ microorganisms and products of their life activity with the given properties by microbial synhesis. The techniques used ____ the selective ____of plants, animals, and microorganisms, and the ____ of specific genes from one species to another. The field of biotechnology includes areas as diverse as food ____, waste ____, and mining, food production and medicine. Not only the quantity produced is important but also the uniform____ of the product. The ____ of an embryo are ____ from a fertilized egg by mitotic cell k.D. ____. The genes that produce the immunogenic proteins are ____ into a harmless bacterium or virus. Injection of this virus into test animals resulted in ____ against all three diseases. To have developed the technique for ____and ____ specific genes in various organisms made tremendous advance in medical treatment.

14. Discuss the derivatives. Does the word denote / signify an object, action, process, property, person, phenomenon or other?

biochemical – biochemically – biochemist – biochemistry, biological – biologically – biologist – biology, process – processed – unprocessed – processing, genetic – genetics – genetical – genetically, disimmunne – immune – immunity – immunal – immunogenic, cell – cellular – acellular –

unicellular – multicellular – intracellular – extracellular – cellulose, metabolism – metabolical, membrane – membranous.

15. Match the synonyms.

happen, control, matter, change, include, differ, consist, join, elliminate, create, let out, evolution, production, include, move, choose, amount, reach, treatment, alike, introduce, couple, substance, vary, occur, be composed, check, remove, comprise, alter, release, development, similar, quantity, manufacture, processing, transfere, select, imvolve, insert, achieve.

16. Match the notions and their definitions.

1) in vivo, gene, mutational, byolisis, in vitro, phagocyte, delete, vaccine, immunity, surface, vector vaccine.

2) one of the factors controlling heredity; occurring in nature; recombinant-DNA techniques in which foreign genes are used; a virus that infects cells of two or more identical linear acid molecules in tandem; causing hereditary change in the base sequence of the nucleic acid in the genome of an organism; suspensions of killed or modified pathogenic microorganisms, inducing immunity to a particular disease**;** safety, security from disease; techniques of deleting genes involved in virulence but leaving those products elicit an immune response; take out; disintegration of organic matter.

17. Prepare the text for the back translation.

18. Analyze the tense and voice of the verbs in the text. Use them in the sentences.

19. Make up a story about your studies and your future speciality using the tense and apect forms in active voice to match the following adverbs of time.

Model 1. Indefinite Tense. Present / Past / Future: I study / studied /

will study many subjects.

Model 2. Continuous Tense. Present / **Past** / **Future** I am / was / will be studying many subjects.

Model 3. Perfect Tenses. Present / Past / Future: I have / had / will have studied many subjects

often, every day, usually, as a rule, used to, seldom, last / next year, next week, just, already, yet, now, at this very moment, for several hours, since long ago.

20. Translate the prepositional word groups, transform them into nonprepositional ones, changing the word order.

processing of food, disposal of waste, vessels for blood, clotting of blood, advance in medical treatment, applications in medicine, cells from commercial potato plants, needs for quality, insulin for humans, hormone for human growth, production by culturing bacteria.

21. Fill in the gaps with prepositions and conjunctions.

for, from, as, after, both, at, around, to, although, because, of, in, than, either, or, as for.

1. ____ my future speciality I will be a food technologist. 2. There are universities ____ us to sudy. 3. We study ____ organic and inorganic chemistry, biochemustry, molecular chemistry, and genetic engineering ____ the course ____ studies. 4____ the field of biotechnology includes areas ____ diverse ____ food processing, waste disposal, and mining, some of its most significant contributions have been ____ food production and ____ medicine. 5. Many processes associated with biotechnology center ____ the use of recombinant DNA. 6. Biotecnological methods involve the transfer of specific genes ____one species ____ another. I like my future speciality ____ it is useful ____ me and society. 7. ____ my studies I will develop healthy food and reliable drugs. 8. I will be able to work ____ any food ____ farmaceutical entreprice ____ our course

of studies covers a broad range of disciplins.

22. Use different tense forms of the verb as well as the connective and argumentation words in the dialogues on the following problems.

1. The notion of biotechnology. 2. It's importance for food industry. 3. Methods of improving plant and animal food. 4. New discoveries in biotechnology. 5. Biotechnology as your future speciality.

What statement / hypothesis / concept / idea / theory / proposal / suggestion / presumption are you putting out / forward? What concept do you defend? What do you insist on?

to ground the theory with facts, on the ground of, stand ground, well-grounded theory, lay the ground for / foundation for / the truth lies in the fact that. What theory underlies your research? We should rely on the facts only.

state, challenge, argue, object, (dis)agree, exactly so, support the statement, disagree, So do I. Neither do I. neither…nor; not only, but also; but for, nobody, nothing, nowhere.

23. Translate the following abstract into English using different tense forms.

За визначенням Європейської біотехнологічної федерації (ЄБФ), біотехнологія є такою інтеграцією природничих та інженерних наук, за допомогою якої використання клітин, клітинних структур та окремих біомолекул дає можливість одержувати якісніші і дешевші продукти медичного та промислового призначення або проводити інші корисні маніпуляції. Основними об'єктами біотехнології в наш час є мікроорганізми. У своїй основі біотехнологія є синтезом таких наук, як мікробіологія, біохімія, молекулярна біологія, генетика, органічна, аналітична і неорганічна хімія, процеси і апарати та ін.

У 70-і роки XX ст., коли була показана можливість введення змін до генофонду організмів, що зробило біотехнологію однією з

найбільш економічно вигідних галузей. Інтенсивно біотехнологія почала розвиватися з середини XX століття. Завдяки розвитку медичної промисловості виникли процеси промислового одержання амінокислот, вітамінів, ферментів та ін.

Біотехнологічні процеси значно розширили сферу виробництва у харчовій промисловості, екології, фармакології. Біохімікам Російської академії вдалося розробити вакцину проти ВІЛ-інфекції, під впливом якої імунна система людини не тільки виробляє антитела до вірусу, але й активізує клітини-вбивці поїдати чужерідні клітини. Нова вакцина під робочою назвою “комбиВИЧвак” складається з вірусоподібних частинок, у білках яких відібрані ділянки, що викликають зворотню реакцію імунної системи людини.

Part II

24. Read the following text and describe the cell.

Cell Structure

Cells are the basic structural units of all living organisms. Cells may have the form of primitive animals (protozoa) or plants (bacteria and some algae). There are two types of cells found in all currently existing organisms: prokaryotic and eukaryotic. Prokaryotes are simpler in structure than eukaryotes. Unlike the prokaryotes, the eukaryotes carry out their various metabolic functions in membrane-bound compartments called organelles.

There are three types of bacterial shapes: rodlike (bacilli), spheroidal (cocci), and helically coiled (spirilla). A rigid cell wall maintains the organism's shape and protects it from mechanical injury.

Although the prokaryotic cell lacks a nucleus, a circular DNA molecule called a chromosome is located in an irregularly shaped region called the nucleoid. Many bacteria contain additional small circular DNA molecules

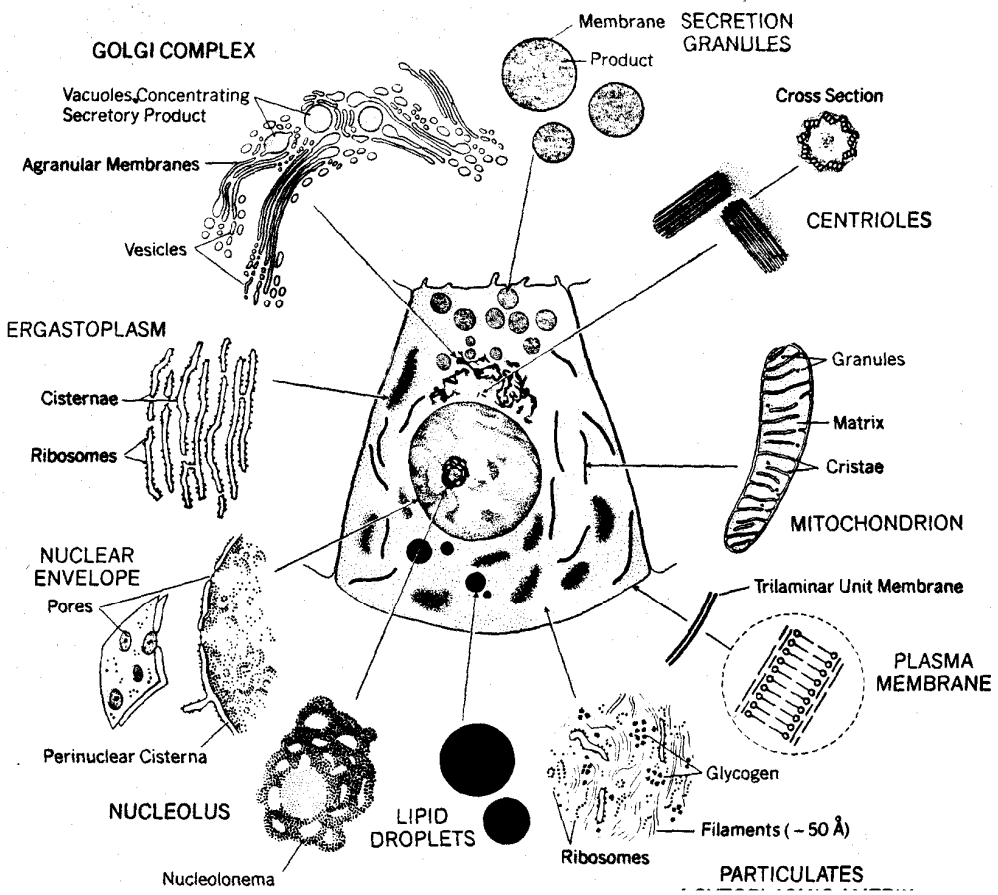


Figure 1.

A typical cell is shown in the center of this drawing with its various organelles and inclusions suspended in the fluid medium called the cytoplasm. The roundish structure in the center of the cell is the nucleus, which is bounded by the nuclear envelope. The ergastoplasm, also called the rough endoplosmic reticulum, is a network of sacs and tubules that act as channels for materials passing through the cell. The illustration of the plasma membrane encircled by a dashed line is not directly seen but is inferred from indirect methods of analysis.

called plasmids.

The plasma membrane of both prokaryotes and eukaryotes performs several vital functions. The most important of these is a process referred to as selective permeability in which certain substances are prevented from entering the cell and others are prevented from leaking out.

The nucleus of eukaryotes performs two vital functions for the cell. First, it contains the cell's blueprints, that is, it stores the cell's information. Second, the nucleus exerts a profound influence over all cellular metabolic activities. The nucleolus, a structure found within the nucleus, plays a major role in the synthesis of the RNA component of ribosomes.

The is a remarkable similarity between plant and animal cells at the cellular and subcellular levels. Two main features—a rigid cell wall and the presence of plastids — distinguish the cells of higher plants.

The cell wall is an extracellular structure, lying just outside the plasma membrane. It consists of cellulose fibers embedded in a matrix containing interlinked polysaccharides, such as pectins and hemicelluloses. The main function of the cell wall is to provide varying degrees of rigidity to different areas ot the plant. This is accomplished by osmotic pressure. When a cell without a cell wall takes up water, it swells and ultimately bursts. However, when surrounded by a cell wall, the same cell will produce a very rigid structure when it takes up water. Plant cells contain various types of organelles called plastids, which are involved in photosynthetic processes. Mitochondrialike, including the possession of their own DNA, plastids are derived from the egg, or female cell, and multiply independently in the cytoplasm. Small proplastids are precursors, which can develop into the green, chlorophyll-containing chloroplasts, yellowish etioplasts (modified chloroplasts found in plants grown in the dark), yellow-red chromoplasts containing carotenoid pigments, or leucoplasts, some of which store starch and may be involved in gravitational responses.

25. Ask your own questions of different kinds on the text.

26. Make up an abstract of the text with key words, introductory and connective words. Learn it by heart and retell.

27. Find in the text the following word combinations and translate them into Ukrainian.

cellulose fibers, containing interlinked polysaccharides, provide varying degrees of rigidity, accomplished by, osmotic pressure, surrounded by a cell wall, involved in photosynthetic processes, the possession of their own DNA, liberated from water, discards the oxygen as waste, occurs by way of, separate chemical processes, reduced sulfur compounds, fatty acids, enzymic reactions, assimilating carbon dioxide, convert the energy, break into components, use or absorb.

28. Find the English equivalents of the following Ukrainian word combinations.

помітна схожість між, підкіліттний рівень, дві головні риси, містити щось, складатися з, походити з, хімічна сполука, спричиняти тиск, які знаходяться у рослинах, розмножуватися незалежно, накопичувати крохмаль, розпад сполук, брати участь у гравітаційній реакції, набрякнути і луснути.

29. Match the synonyms.

accumulate, beast, fasten, split, engaged, breething, transform, apply, supply, necessary, animal, convert, adlust, involved, respiration, gather, break, use, provide, essential.

30. Match the notions and their definitions.

1) cell, organelle, bacilla, nucleus, centriole, plastids, blueprints, microorganism, nucleolus, chromosome, plasmids, nucleoid.

2) the cell's information, component of living organisms, a circular DNA molecule, membrane-bound compartment, central part of a cell, rodlike bacteria, the smallest living being, a structure found within the nucleus, irregularly shaped region, part of a cell, organelles involved in photosynthetic processes, additional small circular DNA.

31. Fill in the gaps.

generation, provide, breakdown, pressure, swell, burst, fibre, innvlved, possession, derived, multiply, cell, leak out, transfer, store, prevent, maintain, protect, injury.

A rigid cell wall ____ the organism's shape and ____ it from mechanical ____. Although the prokaryotic cell lacks a nucleus certain substances are ____ from entering the cell. Others are prevented from ____. The nucleus of eukaryotes ___ the cell's information. The Golgi apparatus is ____ in the packaging and secretion of cell products. Peroxisomes contain a variety of oxidative ____. These organelles are most noted for their involvement in the ____ and ____ of peroxides.The cell wall consists of cellulose ____ embedded in a matrix containing interlinked polysaccharides. The main function of the cell wall is to ____ varying degrees of rigidity to different areas of the plant. This is accomplished by osmotic ____. When a cell without a cell wall takes up water, it ____ and ultimately ____. Mitochondrialike, including the ____ of their own DNA, plastids are ____ from the egg, or female cell, and ____ independently in the cytoplasm.

32. Prepare the text for the back translation.

33. Transform the participles into sentences wherever possible.

1. There are two types of cells found in all currently existing organisms: prokaryotic and eukaryotic. 2. Unlike the prokaryotes, the eukaryotes carry out their various metabolic functions in membrane-

bound compartments called organelles. 3. Although the prokaryotic cell lacks a nucleus, a circular DNA molecule called a chromosome is located in an irregularly shaped region called the nucleoid. 4. Many bacteria contain additional small circular DNA molecules called plasmids. 5. The most important of the plasma membane functions is a process referred to as selective permeability. 6. Ribosomes are complex structures composed of a variety of proteins and a type of RNA called ribosomal RNA. 7. The nucleolus, a structure found within the nucleus, plays a major role in the synthesis of the RNA component of ribosomes. 8. Formed from relatively large, flattened, saclike membranous vesicles that resemble a stack of plates, the Golgi apparatus is involved in the packaging and secretion of cell products.

34. Transform the sentences into participles.

Model. Peroxisomes are organelles which generate and breakdown peroxides. – Peroxomes are organelles genetationg and breaking down peroxides.

1. A chromosome is located in an irregularly shaped region which is called the nucleoid. 2. The most important plasma membrane function is selective permeability which prevents certain substances from entering the cell and others from leaking out. 3. the Golgi apparatus performs important functions, it packages and secrets cell products. 4. Peroxisomes are small spherical membranous organelles that contain a variety of oxidative enzymes. 5. A circular DNA molecule which is called a chromosome is located in an irregularly shaped region which is called the nucleoid. 6. All of these functions are accomplished through extreme miniaturization, which are facilitated by a high degree of organization of subcellular components.

35. Use different tense forms of the verb as well as the connective and argumentation words in the dialogues on the following problems.

1. The similarity and difference between an animal and plant cell. 2. The

functioning of a plant. 3.The green pigment of a plant. 4. The achievements in cells studies.

36. Translate the following text into English.

Форма клітини варіює в широких межах і тісно пов'язана з функцією, яку вони виконують. До складу клітини входять *білки, ліпіди, нуклеїнові кислоти, вуглеводи,* фосфорорганічні сполуки; неорганічні іони і вода. Всі клітини побудовані за єдиним планом і обов'язково містять *цитоплазму.*

Розрізняють еукаріотичні клітини, що мають оформлене *ядро* та прокаріотичні клітини, які не мають структурно оформленого ядра. В цитоплазмі клітини містяться спеціалізовані на виконанні різних функцій *органоїди: ендоплазматична сітка, мітохондрії, Гольджі -комплекс, центросома-, рибосоми, лізосоми,* мікро-грубочки й різні *включення клітини,* що виникають у процесі *метаболізму*. Крім загальноклітинних органоїдів, у клітини можуть бути спец, органоїди, пов'язані з специфічною функцією клітини, напр. *міофібрили* м'язових клітин, *війки* миготливого епітелію тощо. В побудові клітини беруть участь *мембрани біологічні* ліпопротеїдної природи. З поверхні клітини одягнені *плазматичною мембраною,* що регулює транспорт речовин між клітиною і навколишнім середовищем; на ній відбуваються складні каталітичні реакції метаболізму та розміщуються специфічні *рецептори,* за допомогою яких клітина «спілкується» з зовн. середовищем. Клітини рослин містять ще *пластиди, вакуолі* й розташовану над плазматичною мембраною щільну оболонку, утворену целюлозою, геміцелюлозою, пектином або *хітином* (гриби); вона визначає механічні властивості рослин.

LESSON 2

Verbs Tenses. Passive Voice

Present, Past Participle

Part I

1. Read and memorize the following words and word combinations.

essential	важливий
living tissue	жива тканина
amino acid	амінокислота
incomplete protein	неповноцінний білок
ability	здатність, вміння
support growth	підтримувати ріст
replication	повторення, копіювання
transcription	переписування, копіювання
nucleic acid template	шаблон амінокислоти
codon recognized	опізнаний кодон
mismatch phenomenon	явище неспівпадення
wobble	коливатися
compound	сполука
starch	крохмаль
divide	ділити
contain	містити
soluble	розчинний
molecular weight	молекулярна вага
replace	заміняти
significance	важливість
subunit	підрозділ
link	зв’язок, зв’язувати

2. Find the international words in the text and give their Ukrainian analogues.

3. Form the adjectives with the suffixes: -al, -ic, -ient, -ar, -ant, -ve, -less.

procariote, eucariote, gene, chemistry, biotechnology, commerce, endoplasm, plasminogene, immunogene, cycle, cell, chrome, single, substance, microscope, signify, synthesis, independence, nature, bacteria, agriculture, significant, resistance, microbe, fungus, organ, medicine, select, product, information, gravitation, solution, fundament.

4. Form the antonyms with the negative prefixes: de-, un-, ab-, anti-, non-, ill-, ir-, in-, im-.

composition, fusion, mobilisation, grade, contaminate, infect, increase, complete, adequate, normal, associate, surrounded, used, direct, bacterial, produced, classified.

5. Read the text in 3 minutes time and add what you know to the information given. Read and translate the text.

Proteins Structure and Synthesis

The living tissues of plants and animals consist of protein material. Protein takes many forms and is fundamental to life. Proteins make up the vital part of essential jelly material of the living cell – the protoplasm. The living tissues of plants and animals consist of protein material which is continually destroyed in the maintenance of life and must be restored. White of an egg is an example of pure protein.

Proteins are complex in nature and are composed of a number of amino acids. Proteins are composed of amino acids, for which the general formula is

R-CH—COOH

NH_2

Thus we have within the molecule a basic group, NH_2, capable of coupling with an acidic group, an acidic group, COOH, similarly capable of coupling with a basic group, with the elimination of water in each case. This is, in fact, the way in which the first stage, and sometimes the only stage, of protein synthesis takes place. Most proteins contain from 5I to 55 per cent of carbon, about 7 per cent of hydrogen, from 20 to 23 per cent of oxygen, from 15 to 18 per cent nitrogen. Some of them also contain a little phosphorus or iron.

Proteins classification as complete, partially complete and incomplete is based upon their ability to support normal growth and to maintain life. A complete protein is one that is adequate to support normal growth and to maintain life. A partially complete protein is one that maintains life but does not support normal growth. An incomplete protein will by itself neither support normal growth nor maintain life. Most animal proteins are complete. Plant proteins are more or less incomplete.

The first two steps in protein synthesis are biological information *transfer, replication* and *transcription,* which involve synthesis of nucleic acids using nucleic acid templates. The last step, *translation,* involves a nucleic acid template. Codon is recognized following specific base-pairing with a sequence of three bases on a tRNA called the anticodon. If this base-pairing was always the standard pairing of A with U and G with C, then one would expect at least one specific tRNA to exist for each codon. In some cases, this is true. For instance, there are six different tRNAs in *Escherichia coli* that carry the amino acid leucine, one for each codon. By contrast, some tRNAs can recognize more than one codon. For instance, in *E. coli,* although there are two lysine codons, there is only one lysyl tRNA, and its anticodon can base pair with either AAA or AAG. This is possible because in these cases tRNA molecules form standard base pairs at only *the first two* positions of the codon, while tolerating irregular base pairing at the third position. This apparent mismatch phenomenon is called wobble.

Protein synthesis begins with the gene. Encoded in a gene are the

instructions for the synthesis of a specific protein molecule. The process begins with the transcription of the genetic message in the DNA to a molecule of complementary mRNA (messenger RNA). After a number of processing steps within the nucleus (during which parts of he original mRNA molecule may be cut out and the remainder spliced together), the mRNA molecule leaves through a nuclear pore.

At the cellular level there are two main patterns of protein synthesis. If the protein is to be used within the cell, the mRNA enters the cytoplasm and becomes associated with free ribosomes to form a polysome. Then molecules of a third class of RNA, tRNA (transfer RNA), attach to amino acids (the building blocks of proteins) and bring them to the polysome. The genetic blueprint, now secondarily imprinted in the mRNA, directs the types and order of amino acids to be linked together to form the polypeptide chains (the backbone of the protein molecule). Several protein molecules are simultaneously synthesized on a single mRNA molecule. The ribosomes act almost like directors to maintain the flow of protein synthesis.

The other main pattern of protein synthesis is involved if the protein to be synthesized is destined to be secreted from the cell. In this process the mRNA becomes associated with the rough endoplasmic reticulum. The polypeptide chains are synthesized in the rough endoplasmic reticulum and are then moved on to the Golgi apparatus for further modeling and the addition of carbohydrate side chains. The finished proteins leave the Golgi apparatus in small membrane-surrounded vesicles and are ultimately released from the cell.

6. Explain: 1) the title; 2) the topic (object, subject) of the text: whether it is an object (thing), process, phenomenon, substance, property, method, notion, ability, value, or other; 3) the aim (idea) of the text: whether it is a better method, or a product with better properties.

Use the verbs: tell, account on, write, deal with, describe, throw light upon, mention.

7. Find out the details of the text to give answers to the following questions.

1. Why are proteins fundamental to life? 2. What are proteins composed of? 3. Are proteins classified on the basis of their properties? 4. What is proteins classification based upon? 5. Does incomplete protein support normal growth or not? 6. What are the stages of protein synthesis? 7. What kinds of RNA are engaged in protein synthesis and what are theis functions? 8. How is protein synthesis going on? 9. One pattern of protein synthesis differs from amother, doesn't it? 10. Where are the polypeptide chains synthesized?

8. Ask your own questions of different kinds on the text.

Write an abstract of the text according to the plan below using the introductory and connective words and learn it by heart.

1. the object, 2. the aim,3. the actuality, 4. the scientific sugnificance, 5. the practical application, 6. the problems, 7. the methods, 8. your contribution, 9. the conclusions.

10. Find in the text the following word combinations and translate them into Ukrainian.

fundamental to life, make up the vital part of, essential jelly material, the living tissues, consist of protein material, destroyed in the maintenance of life, must be restored, pure protein, complex in nature, composed of a number of amino acids, partially complete protein, based upon, ability to support, growth, maintain life, animal cells, bounded by, an outer plasma membrane, like all biological membranes, contains two layers of.

11. Find in the text the English equivalents of the following Ukrainian word combinations.

вуглець, повноцінний білок, не зовсім повноцінний, більш – менш, достатній для, підтримувати ріст, перенос інформації, копіювання та

переписування, перший крок, стандартне парування, опізнавання кодону, вслід за, шаблон амінокислот, парування основ, послідовність основ, нерегулярне парування основ, явище неспівпадення.

12. Fill in the gaps.

rate, blueprint, gene, maintain, encoded, attach, transcription, chains, polysome, patterns, nucleus spliced, nucleus,

The ____ of the biological processes are under complex controls. Protein synthesis begins with the ____ . ____ in a gene are the instructions for the synthesis of a specific protein molecule. The process begins with the ____ of the genetic message in the DNA to a molecule of complementary mRNA (messenger RNA). During a number of processing steps within the ____ parts of the original mRNA molecule may be cut out and the remainder ____ together). At the cellular level there are two main ____ of protein synthesis. The mRNA enters the cytoplasm and becomes associated with free ribosomes to form a ____ . Then molecules of a third class of RNA, tRNA ____ to amino acids and bring them to the polysome. The genetic ____, now secondarily imprinted in the mRNA, directs the types and order of amino acids to be linked together to form the polypeptide ____ . The ribosomes act almost like directors to ____ the flow of protein synthesis.

13. Match the synonyms.

basic, consist of, ruin, renew, be formed of, nourishment, enough, albumin, form, pass through, allow, protein, destroy, nutrition, main, create, restore, adequate, main, be composed of,

14. Discuss the derivatives. Does the word denote / signify an object, action, process, property, person, phenomenon or other?

inhibit – inhibition – inhibited – inhibiting; synthesis – synthetic – synthetical – synthetically – synthesize – synthesized – synthesizing, protein – proteinous, destroy – destroying – destroyed – undestroyed – destruction, complement – complementary, component – compound –

compose – composing – composed – composition; acid – acidic – acidity – hiperacidity – aciduous; oxygen – oxygenous – oxide; complete – incomplete – completion – completed – complex, disaccaride – monosaccaride – polysaccaride.

15. Define the following notions through the general notions of an object (thing), process, phenomenon, property, ability, value, matter / substance, reaction.

protein, protoplasm, plasma membrane, osmotic pressure, concentration gradient, hydrofolic, complete protein, partially complete protein, incomplete protein.

16. Find the words or word combinations in the text to match the definitions.

transfer RNA, the building blocks of proteins, the backbone of the protein molecule, apparent mismatch phenomenon.

17. Prepare the text for the back translation.

18. Analyze tense and voice of the verbs in the text. Give their tense forms in the sentences.

19. Give the passive voice of the verbs below in different tense and aspect forms to speak about the cell using the models.

Model 1. Passive voice. Indefinite Tenses. Present/Past/Future
The cell **is / was / will be** studied.

Model 2. Continuous Tenses. The cell **is / was being** studied

Model 3. Perfect Tenses. The cell **has / had / will have / been** studied.

destroy, restore, compose, couple, be capable of, eliminate, base, use, recognize, expect, carry, base pair with, call, begin, process, cut out, leave, associate, attach, bring, imprint, direct, link, act, destine, secret, divide, contain, replace, find, know.

20. Use modal verbs with verbs from the text in active and passive voice in the situations to express supposition.

Model: There can / may / must / should / ought to / be different compounds.

21. Use the Passive Voice as well as the argumentation and connective words in the dialogues on the following topics.

1. Proteins' a) function, b) compositions, c)classification, d)synthesis.

I state / claim / declare that ____. This statement wants / needs / requires grounding / proving / illustrating

It's just so / quite on the contrary

I am of the same opinion / of the opposite opinion.

No objections. I withdraw my objections / argument

There is no denying / arguing the fact that

Let's compare / let's draw a comparison between, It's uncomparable.

arrive at a conclusion / decion that

achieve a result / success / one's aim / one's object / one's purpose

challenge, argue, exactly so, support the statement, since, thus, nevertheless, it goes without saying, certainly, evidently, undoubtedly.

22. Translate the following text into English.

Найважливішою складовою частиною клітин усіх організмів є білки. Це органічні сполуки, до складу яких входять такі елементи: карбон, гідроген, оксиген, нітроген. Деякі білки містять сульфур. Молекули білків – це довгі ланцюги, які побудовані з амінокислот. У складі природних білків виявлено двадцять амінокислот. У білках усі амінокислоти, за винятком проліну (амінокислоти), є α-амінокислотами, тобто містять аміногрупу (—NH_2) біля вуглецевого атома, рахуючи від карбоксильної групи (—COOH). Інша частина молекули амінокислоти називається радикалом (R). У молекулі найпростішої амінокислоти – гліцину роль радикала відіграє гідроген.

Органічним сполукам, в яких біля атома вуглецю є чотири різних замісники (атом або група атомів), властива оптична (дзеркальна) ізомерія. Такий атом карбону називається *асиметричним,* а за розміщенням замісників навколо такого атома карбону розрізняють стереоізомери *L*- і *D*-ряду, які відносяться один до одного, як предмет і його дзеркальне відображення. Подібні ізомери називаються *дзеркальними ізомерами,* або *енантіомерами.* Зауважимо, що дзеркальні ізомери не залежать від площини обертання поляризації світла і позначаються як (+) – повертає вправо і (-) – вліво.

Білки становлять 40-80 % маси бактеріальної клітини і представлені простими білками *(протеїнами)* і складними *(протеїдами).* Протеїни складаються тільки з амінокислот, протеїди — з амінокислот і речовин небілкової природи. Амінокислотний склад білків різних видів бактерій кількісно та якісно різний. Так, у складі білків сарцин міститься багато лізину, у бацил — глутамінової кислоти. Більшість бактерій самі синтезують всі необхідні їм амінокислоти (наприклад, *Escherichia coii).* Але деякі бактерії не мають такої здатності і потребують готових амінокислот, які вносять у поживне середовище. Це так звані *ауксотрофи.* Мікроорганізми можуть бути ауксотрофами не тільки за амінокислотами, а й за вітамінами, нуклеотидами та ін.

За біологічними функціями білки є ферментами, токсинами, антигенами, транспортними білками. Регуляторна функція білків полягає в тому, що багато з них є біологічно активними речовинами. Вони регулюють обмін речовин (інсулін, гормони росту).

До важливих функцій білків у клітинах належить їх захисна функція — утворення антитіл, комплементу, фібриногену, тромбіну, які захищають клітини й організми від сторонніх білків, утворюючи комплекси антиген — антитіло, тромби. Однак у деяких випадках білки можуть виявляти і токсичні властивості.

Part II

23. Read and sum up the text.

Carbohydrates

Carbohydrate kar-bo-hi'drat is any of a large class of carbon-hydrogen-oxygen compounds that includes the simple sugars and their polymers (chiefly starch, glycogen, and cellulose). Most carbohydrates are produced by photosynthesis in plants. They are the major food compounds for both plants and animals, and one group of carbohydrates (cellulose) is the chief structural material of plants.

Most carbohydrates are represented by the formula $C_x(H_2O)_n$, where n is three or higher. On the basis of their chemical structure, carbohydrates are classified as polyhydroxyaldehydes, polyhydroxyketones, or their derivatives.

Carbohydrates are divided into four groups, according to the number gf simple sugars or their derivatives contained within the carbohydrate molecule. Nearly all are white solids that are soluble in water, and those of low molecular weight are sweet.

The monosaccharides are simple sugar molecules made up of three, four, five, or six carbons in chain or ring form. The three-carbon sugars, called trioses, include glycer-aldehyde, an aldo-sugar, and dihydroxyacetone, a keto-sugar. Tetroses, or four-carbon sugars, include D-erythrose and D-threose.The five-carbon sugars are called pentoses. Some, such as D-ribose and D-xylose, occur widely in nature and are of great biological sig-nificance. In deoxy compound a hydrogen atom replaces the hydroxyl grup and it has one less oxygen atom. One deoxy compound, 2-deoxy D-ribose, is a major component of biological coding systems.

Six-carbon sugars, the hexoses, are the most important intermediate source of energy to biological organisms Common natural hexoses include

D-glucose, D-mannose, D-galactose, and D-fructose. D-fructose, a common monosaccharides, the hexosamines, have an amino group (NH_2) in place of the hydroxyl group on the second carbon atom. These compounds are the monosaccharide subunits in chitin, heparin, and hyaluronic acid and also are known as mucopolysaccharides.

The disaccharides are molecules of two simple sugars linked together. Common disaccharides are maltose, lactose, and sucrose. The trisaccharides are raffinose (fructose, glucose, and galactose) and melezitose (glucose, glucose, and fructose). The most commonly known polysaccharides are cellulose, starch, and glycogen.

24. Ask your own questions of different kinds on the text.

25. Sum up the text with key-words.

26. Find in the text the following word combinations and translate them into Ukrainian.

compound includes, chiefly starch, the major food compounds, for both plants and animals, the chief structural material, carbohydrates are represented, on the basis of, their derivatives, are divided into, according to the number of simple sugars, contained within, nearly all, white solids, soluble in water, of low molecular weight, made up of, in chain or ring form, are called pentoses, some occur widely in nature, of great biological significance, replace the hydroxyl grup, intermediate source of energy to, a common fruit sugar, found in honey, in place of, monosaccharide subunits, are known as, linked together.

27. Find in the text the English equivalents of the following Ukrainian word combinations.

сполука включає, прості сахари, головним чином, виробляються фотосинтезом, на основі, представлені формулою, згідно з кількістю атомів вуглецю, головна сполука, так само, як; розчинні в воді,

молекулярна вага, проміжне джерело енергії, названі тріозами, відомі як, складаються з вуглеводів, заміщувати гідроксильну групу, широко зустрічатися, біологічно значущий, знайдені в меді, зв'язані разом.

28. Fill in the gaps.

compounds, linked, chain, found, subunits, occur, produced, divided, soluble, replace, derivatives.

Carbohydrate is any of a large class of carbon-hydrogen-oxygen _____ that includes the simple sugars and their polymers. Most carbohydrates are _____ by photosynthesis in plants. On the basis of their chemical structure, carbohydrates are classified as polyhydroxyaldehydes, polyhydroxyketones, or their ____. Carbohydrates are ____ into four groups, according to the number of simple sugars or their derivatives. Nearly all are white solids that are ____ in water, and those of low molecular weight are sweet. The monosaccharides are simple sugar molecules made up of three, four, five, or six carbons in ____or ring form. Some, such as D-ribose and D-xylose, ____ widely in nature and are of great biological significance. In deoxy compound a hydrogen atom ____ the hydroxyl grup and it has one less oxygen atom. D-fructose is a common fruit sugar which also is ____ in honey, These compounds are the monosaccharide ____ in chitin, heparin, and hyaluronic acid. The disaccharides are molecules of two simple sugars ____together.

29. Prepare the text for the back translation.

30. Use the Passive Voice as well as the argumentation and connective words in the dialogues on the following topics.

1. Classification of carbohydrates according a) to their chemical structure, b) to the number of simple sugars. 2. Carbohydrates importance in nutrition and production. 3. Students' day and diet.

31. Translate the following text into English.

Вуглеводи — це сполуки, які містять карбон, гідроген, оксиген у співвідношенні 1:2:1. Всі вуглеводи є або альдегідами, або кетонами, і в молекулах їх завжди міститься кілька спиртових гідроксильних груп. Хімічні властивості вуглеводів залежать від наявності цих груп. Альдегіди окиснюються з утворенням кислот або відновлюються, утворюючи первинний спирт. Кетони відновлюються, утворюючи вторинний спирт.

Вуглеводи поділяють на три групи: моносахариди, дисахариди і полісахариди. Моносахариди — це прості цукри, які містять від 3 (тріози) до 9 (нонози) атомів карбону. Найважливіше значення для клітин мають пентози (5 атомів карбону в молекулі) і гексози (6 атомів карбону в молекулі). Вони можуть бути альдозами (якщо містять альдегідну групу) і кетозами (якщо містять кетогрупу). Прикладами альдоз є пентоза рибоза і гексоза глюкоза Прикладами кетоз є пентоза рибулоза і гексоза фруктоза.

Полісахариди відіграють здебільшого роль резерву поживних речовин і енергії (крохмаль і глікоген) та використовуються як будівельний матеріал (клітковина). Як запасні поживні речовини полісахариди важливі для живлення клітин тому, що вони мають великі розміри молекул, що робить їх практично нерозчинними у воді, отже вони не чинять на клітину осмотичного тиску і не завдають хімічного впливу. Їх ланцюги компактно згортаються і за потреби полісахариди швидко перетворюються на цукри внаслідок гідролізу. Полісахариди, побудовані з пентоз, називаються *пентозанами,* а з гексоз *гексозанами.* Найпоширенішими в живій природі є такі полісахариди: крохмаль, глікоген, клітковина, інулін.

LESSON 3

The Sequence of Tenses

Part I

1. Read and memorize the following words and word combinations.

exist	існувати
bond, link	приєднувати
weight	вага
in addition	в додаток
be refered to, be called	називатися
belong to	належати до
myelin sheath	мієлінова оболонка
nerve axon	нейрит
digestive bile salts	травні солі жовчі
fused ring	конденсоване ядро
recognition site	ділянка опізнавання
interact	взаємодіяти
invading organism	організм, що втручається
relay	передавати
saponifiable lipids	мильні ліпіди
string	низка
bylayer	проміжний шар
dispose of	мати в наявності
semisolid	напівтвердий
direct	спрямовувати, керувати
means	засіб
tend to accept	здається приймає
sequence	послідовність

backbone	стрижень, кістяк
determine	визначати
primary structure	первинна структура
intermediary converts	проміжні покриття

2. Find the international words in the text and give their Ukrainian analogues.

3. Form the nouns with the suffixes: -ty, -ry, -ance, -er, -or, -ment -able, -ible.

maintain, lay, promote, control, activate, engine, quality, quantity, diverse, permeable, select, achieve, treat, injure, message.

4. Form the words with the prefixes: bio-, micro-, macro-, poly-, mono-, hemi-, uni-, semi-, multi-, hetero-, pro-, pre-.

cyclic, chemistry, technology, cellulose, solid, saccaride, vitamin, organism, molecula, synthesis, mass, cellular, plastid, cursor, mature.

5. Look through the text as quickly as you can for it's topic and aim.

6. Read the text to analyze the value of lipids for health. Read and translate the text.

Lipids

Carbohydrates bond to major biochemicals, forming glycoproteins and glycolipids. Most proteins exist as glycoproteins, with carbohydrate making up as much as 80% of the weight of the complex. Glycoproteins and glycolipids found on cellular surfaces function as recognition sites when the body's cells interact with each other or with bacteria and viruses, so that cells can be identified either as belonging to the body or as invading organisms. These compounds also relay hormonal signals through the

membrane.

In addition to carbon, hydrogen, and oxygen, these organic compounds contain other elements, such as nitrogen or phosphorous. Lipids possessing a molecular group that can be hydrolyzed – broken apart using water molecules – are called saponifiable lipids, while those that cannot be hydrolyzed are referred to as nonsaponifiable lipids.

Waxes, a group of saponifiable lipids, belong to a class of organic compounds called esters, many of which are derived from a combination of carboxylic acid and alcohol. The types of carboxylic acid found in saponifiable lipids are long-chain molecules – that is, they possess a long string of carbon atoms. When the three hydroxyl groups (molecules of oxygen and hydrogen, or OH) contained in the lipid glycerol are bonded to three fatty acids, the ester triacylglycerol, or triglyceride, is formed. Fats and oils are both triglycerides. At room temperature the fats, usually isolated from animal sources, are solid or semisolid, and the oils, which usually come from plants, are liquid.

In the phosphoglycerides, phosphate, rather than fatty acid, is bonded to glycerol. Important components of cell membranes, phosphoglyceride molecules are arranged in a bilayer, with their polar group (a molecular region having two oppositely charged poles) on the outside of the bilayer and the nonpolar fatty-acid chains on the interior. Cell membranes also contain cholesterol and proteins. Although nonpolar compounds can move through the lipid bilayer by diffusion, exiting or entering the cell, the cell membrane is a very effective barrier to the passage of polar substances. However, because the cell must have a mechanism for taking in or eliminating various materials that are either ionic (carrying a positive or negative charge) or highly polar, certain proteins in the cell membrane form channels through which these molecules can pass.

Another component of plant and animal membranes, the

sphingolipids, consist of phosphate (a salt or ester of phosphoric acid), two alcohol groups, and an amino group, all bonded to the long-chain alcohol sphingosine. One sphingolipid, sphingomyelin, is a component of the myelin sheath, the coating around the axons of nerve cells.

The sphingolipids and glycolipids are continuously synthesized, utilized, and then broken down and disposed of by the body. Certain diseases, as yet incurable, are caused by a deficiency of the enzyme necessary for this decomposition. Niemann-Pick disease, caused by a lack of the enzyme sphingomyelinase, leads to mental retardation and premature death, owing to an accumulation of sphingomyelin in the brain, spleen, and liver. Fabry's disease, which results from a lack of α-galactosidase A, can cause renal failure or hypertension-induced cardiac or cerebral complications due to glycolipid buildup.

Among the nonsaponifiable lipids, one group, the steroids, are characterized by a fused ring system consisting of three rings with six linked atoms and one ring with five atoms. Cholesterol, a steroidal alcohol, is an important example of these compounds. Despite its bad reputation, cholesterol is essential for life, serving as a component of the lipid bilayer of cell membranes and being especially abundant in the myelin sheath around nerve axons, thus making up about 1% of the dry weight of the brain. Cholesterol is also a precursor of many steroids and of digestive bile salts.

The steroids often act as hormones. The sex-hormone steroids, for example, which promote the development of sexual characteristics and regulate sexual functions, include androgens (male sex hormones), estrogens (female sex hormones), and progestins (which have specific tasks during pregnancy).

Another lipid group, the prostaglandins, consists of 20-carbon fatty acids present in all tissues.

7. Answer the following questions.

1. What elements do lipids contain? 2. What lipids are called saponifieble and nonsaponifiible? 3. How to classify waxes? 4. What carboxylic acids are found in saponifiable lipids? 5. Do steroids belong to lipids?

8. Ask your own questions of different kinds on the text.

9. Write the plan of the text, entitling the paragraphs.

10. Write an abstract of the text using the verbs of the lesson.

11. Find in the text the following word combinations and translate them into Ukrainian.

major biochemicals, exist as, cellular surfaces, recognition sites, interact with each other, can be identified, belonging to the body, invading organisms, relay hormonal signals through, in addition to, can be broken apart, saponifiable lipids, are referred to as, are derived from, carboxylic acid, long-chain molecules, possess a long string, contained in the lipid glycerol, are bonded to fatty acids, is formed, fats and oils, both triglycerides, at room temperature.

12. Find in the text the English equivalents of the following Ukrainian word combinations.

в додаток, які мають молекулярну групу, розщеплюватися на, як так і, належати до, називатися як, клас органічних сполук, походити від, знаходитися у ліпідах, молекула з довгим ланцюгом, приєднана до, жирна кислота, скоріше ніж, тваринна мембрана, мієлінова оболонка (нерва), складається з трьох кілець, розповсюджений у, травні солі жовчі, попередник стероїдів, присутній в усіх тканинах.

13. Fill in the gaps.

weight, exist, acid, belonging, saponifiable, bilayer, string, invading,

relay, possessing, surfaces, contain, bond.

Carbohydrates ____ to major biochemicals, forming glycoproteins and glycolipids. Most proteins ____ as glycoproteins, with carbohydrate making up as much as 80% of the ____ of the complex. Glycoproteins and glycolipids found on cellular ____ function as recognition sites when the body's cells interact with each other or with bacteria and viruses, so that cells can be identified either as ____ to thebody or as ____ organisms. These compounds also ____ hormonal signals through the membrane. In addition to carbon, hydrogen, and oxygen, these organic compounds. ____ other elements, such as nitrogen or phosphorous. Lipids ____ a molecular group that can be hydrolyzed – broken apart using water molecules – are called ____ lipids, while those that cannot be hydrolyzed are referred to as nonsaponifiable lipids. The types of carboxylic acid found in saponifiable lipids possess a long ____ of carbon atoms. In the phosphoglycerides, phosphate, rather than fatty ____, is bonded to glycerol. Important components of cell membranes, phosphoglyceride molecules are arranged in a ____.

14. Explain the notions.

carbohydrate, glycoprotein, glycolipid, recognition site, saponifiable lipids, nonsaponifiable lipids, long-chain molecules.

15. Find in the text the words to match the notions.

broken apart, a group of saponifiable lipids belonging to esters, not solid, in contact with, in order, take apart, not inside, take away.

16. Match the synonyms.

ground, make, involve, species, take place, meals, aim, component, quantity, surrounding, develop, split, use, food, purpose, application, part, grow, environment, produce, comprise, soil, amount, kind, recognize, microbes, occupy, transmit, include, cleave, transfer, bacteria.

17. Discuss the derivatives. Does the word denote / signify an object, action, process, property, person, phenomenon or other?

lipid – glycolipid – sphingolipid – lipase, phosphprus – phosphate – phosphoric, sterol – steroid – cholesterol, glucolis – glucose – glucoside – glyceride – glycoproteins – glycolipids – triacylglycerol – triglyceride

18. Prepare the text for the back translation.

19. Analyze tense and voice of the verbs in the text. Give their tense forms in the sentences.

20. Render te text in the past tense using the Sequence of Tenses in the past according to the models.

Model 1. It was proved that antibiotics were helpful against infectious diseases.

Model 2. It was known that antibiotics had been discovered by the English microbiologists**.**

Model 3. People believed that natural drugs would substitute the antibiotics in future.

21. Fill in the gaps with prepositions and conjunctions.

to, in, that, of, either or, both, with, so, on, such as, as, and, as well.

Carbohydrates bond ____ major biochemicals, forming glycoproteins and glycolipids. Most proteins exist ____ glycoproteins, with carbohydrate making up ____much as 80% ____ the weight of the complex. Glycoproteins ____ glycolipids found ____ cellular surfaces function ____recognition sites when the body's cells interact ____ each other or ____ bacteria and viruses, ____ that cells can be identified ____ belonging ____ the body ____ as invading organisms. These compounds also relay hormonal signals ____ the membrane. ____ addition ____ carbon, hydrogen, ____ oxygen, these organic compounds contain other elements, ____ nitrogen or phosphorous. Lipids possessing a molecular

group ____ can be hydrolyzed are called saponifiable lipids, while those that cannot be hydrolyzed are referred ____ as nonsaponifiable lipids.

22. Discuss the situations through the interpreter using the Sequence of Tenses as well as the argumentation and connective words.

1. Kinds of lipids. 2. Lipids structure. 3. Lipids functions in the body. 4. Lipids inyour diet. 5. Lipids importance in food industry and relating industries.

do you know that, I wonder if, it is well known fact that, it is evident that, pay attention to the fact that, it is proved that

share opinion of / somebody's opinion, in my opinion/to my mind , I am of the same opinion. I am of quite different opinion. My opinion is quite different.

Opinions differ. come to the opinion (that) / arrive at the opinion, change an opinion, attach, join, stick to the opinion

accept / approve a remark

abstain from discussong the point

the key / clue to the problem is / lies in the fact that, look for the key / clue to the problem, solve a problem / dillema.

In conclusion / as a conclusion / to conclude / concluding, come to / arrive at / jump at a conclusion / decision / agreement / idea / result / end / to understand / to know, Don't jump to the conclusin.

give an example, examplify, examples drawn from life

I hold / state / insist / believe / as far as I know / can prove / can give all proofs that the idea is well grounded.

23. Translate the following text into English.

Ліпіди – це не розчинні у воді органічні сполуки, що містяться в усіх живих клітинах і тканинах. За хімічною природою ліпіди досить різно-манітні, але здебільшого – це складні ефіри будь-якого спирту (найчастіше трьохатомного спирту гліцерину) та вищих жирних кислот.

За біологічними функціями ліпіди поділяють на три групи: 1) структурні та рецепторні компоненти мембран і клітинної поверхні; 2) депо енергії; 3) передавання біологічних сигналів. Для першої і другої груп характерне те, що їх основним компонентом є жирні кислоти. До третьої групи належать вітаміни і структурні гормони. Утворення ліпідів відбувається внаслідок реакції конденсації між гліцерином і жирними кислотами. У складі ліпідів виявлено понад ЗО жирних кислот. Вони бувають насиченими, наприклад пальмітинова ($C_{15}H_{31}COOH$), стеаринова ($C_{17}H_{35}COOH$), та ненасиченими, наприклад олеїнова ($C_{17}H_{3}зCOOH$). Дуже важливу роль у клітинах відіграють фосфоліпіди – ліпіди, що містять залишок фосфорної кислоти:

Молекули фосфоліпідів є амфіпатичними, тобто одна частина молекули – головка – сильнополярна (гідрофільна), а інша частина – хвости, які є вуглеводневими радикалами, – неполярна (гідрофобна). Така особливість будови фосфоліпідів, а точніше, фосфогліцеридів, має надзвичайно велике значення в будові клітинних мембран.

До третьої групи ліпідів – стероїдів – належить холестерин. Холестерин є основним компонентом жовчних кислот, які після виділення їх печінкою в тонку кишку сприяють емульгуванню жирів та їх всмоктуванню, реагуючи з жирними кислотами гідролізованих жирів, внаслідок чого утворюються розчинні у воді комплекси. Щільність багатоциклічного кільця холестерину надає мембранам специфічних властивостей. Після сполучення з білками ліпіди утворюють надкомплекси – ліпопротеїди, з яких побудовані клітинні мембрани. Під час взаємодії ліпідів з вуглеводами утворюються гліколіпіди. ЦІ комплекси амфіпатичні, тобто вуглеводна частина у них полярна, а ліпідна неполярна. Гліколіпіди входять до складу клітинних мембран, особливо багато їх міститься у мієліновій оболонці нервових волокон і на поверхні нервових клітин. В останній час доказано, що мікроорганізми можуть виділяти ліпіди з клітин в культуральну рідину.

Part II

24. Scan the text below to prove the basic role of nucleic acids in the body.

25. Read and sum up the text.

Nucleic Acids

The nucleic acids deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) are macromolecules composed of monomers called *nucleotides.*Therefore, DNA and RNA are polynucleotides.

By directing the synthesis of proteins within the cell, nucleic acids provide the means of biochemical regulation. The monomers forming nucleic acids, the nucleotides, consist of a five-carbon sugar, a phosphate group, and a nitrogen-containing base. (A base is a substance that tends to accept protons and will combine with acid to form a salt.) The monosaccharide ribose serves as the sugar group for RNA (ribonucleic acid), while deoxyribose is found in DNA. The bases contained in DNA – adenine, thymine, guanine and cytosine (abbreviated A, T, G, and C) – are also present in RNA, with the exception of thymine, which RNA replaces with uracil (U). In both DNA and RNA the sugar and phosphate units act as the backbone of the structure, with one of the nitrogen bases bonded to each sugar. As with protein, the sequence of these nitrogen bases is called the nucleic acid's primary structure.

One DNA differs from another in the sequence of bases attached to the sugar-phosphate backbone. Thus variations among organisms are based on differences in this base sequence. The yeast genome was described as being closer to the human genome than anything else that had been completely sequenced up to that time.

DNA carries the genetic blueprint for the cell while RNA is the intermediary molecule that converts the blueprint into defined amino acid

sequences in proteins. A nucleotide is composed of three components: a five-carbon sugar, either ribose (in RNA) or deoxyribose (in DNA), a nitrogen base, and a molecule of phosphate, $PO4^{3-}$. The general structure of nucleotides of DNA and RNA is very similar.

The nitrogen bases of nucleic acids belong to either of two chemical classes. *Purine* bases – adenine and guanine – contain two fused heterocyclic rings (rings containing more than one kind of atom). *Pyrimidine* bases – thymine, cytosine, and uracil – contain a single six-membered heterocyclic ring. Guanine, adenine, and cytosine occur in both DNA and RNA. Thymine is present (with minor exceptions) only in DNA, and uracil is present only in RNA.

Nucleotides consist of a nitrogen base attached to a pentose sugar by a glycosidic linkage between carbon atom 1 of the sugar and a nitrogen atom of the base, either the nitrogen atom labeled 1 (pyrimidine base) or 9 (purine base). Without a phosphate, a base bonded to itssugar is referred to as a nucleoside**,** thus *nucleosides* containing one or more phosphates.

Nucleotides play other roles in the cell, the major role being as constituents of nucleic acids. Nucleotides especially adenosine triphosphate (ATP) are key sources of chemical energy, releasing sufficient energy during the cleavage of a phosphate bond to drive energy-requiring reactions in the cell. Other nucleotides or nucleotide derivatives function in oxidation-reduction reactions in the cell as carriers of sugars in the biosynthesis of polysaccarides and as regulatory molecules inhibiting or stimulating the activities of certain enzyme or metabolic events. The major *informational* function of nucleotides consist of nucleotides covalently bonded,a phosphate from carbon 3 (referred to as the 3' prime carbon) of one sugar to carbon 5 (5') of the *z* acent sugar. Chemically, the phosphate linkage is a phosphodiester**,** since a single phosphate is connected by ester linkage to two separate sugars*.* The *sequence* of nucleotides in a DNA or RNA molecule is referred to as its *primary structure*.

The sequence of bases in a DNA or RNA molecule is informational, encoding the sequence of amino lois in proteins or encoding specific ribosomal or transfere function.

With a few exceptions, all ribonucleic acids are *single-stranded* molecules. However, RNA molecules can fold back upon themselves in regions where complementary base pairing is possible to form folded structures. This pattern of folding in RNA is referred to as its *secondary structure.*

RNA plays three crucial roles in the cell. *Messenger RNA (mRNA)* contains the genetic information of DNA in a single-stranded molecule *complementary* in base sequence to that of DNA. *Transfer RNAs (tRNAs)* are the "adaptor" molecules in protein synthesis. Transfer RNAs convert the genetic information from the language of nucleotides to the language of amino acids, the building blocks of proteins. *Ribosomal RNAs (rRNAs),* of which there are several types, are important structural and catalytic components of the *ribosome,* the protein-synthesizing system of the cell. The informational content of a nucleic acid is determined by the sequence of nitrogen bases along the polynucleotide chain. Both RNA and DNA are informational macromolecules.

RNA can fold into various configurations to obtain secondary structure. The nucleic acid backbone is a polymer of alternative sugar and phosphate molecules.

26. Ask questions of different kinds on the text.

27. Sum up the text with key words.

28. Find in the text the following word combinations and translate them into Ukrainian.

nitrogen-containing base, tends to accept protons, with the exception of thymine, the phosphate unit, act as the backbone of the structure, attached to, releasing sufficient energy, during the cleavage, to

drive energy-requiring reactions, nucleotide derivatives, inhibiting or stimulating the activities, metabolic events, the major informational function, covalently bonded, is connected by separate sugar, encoding the sequence of amino ions, convert the genetic information from…to, is determined by, along the polynucleotide chain, fold into various configurations, to obtain secondary structure, alternative molecules, complementary role.

29. Find in the text the English equivalents of the following Ukrainian word combinations.

нуклеїнова кислота, забезпечувати засіб, складатися з мономерів, спрямовувати синтез, яка приймає, утворювати сіль, служить як цукрова група, за вийнятком урацилу, обєднується з кислотою, одна ДНК відрізняється від іншої, знаходиться в ДНК, як …так і, замінює урацилом, називається як, нести генетичну інформацію, первинна структура, вивільняти енергію, одиниця цукру, приєднаний до молекули цукру, фосфатний зв'язок (2), кістяк структури, послідовність основ, відрізнятися від, описана як, геном дріжджів, проміжна молекула, перетворює інформацію на.

30. Fill in the gaps.

acids, serves, found, attached, provide, converts, accept, consist, bonded, replaces, composed.

The nucleic ____: deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) are macromolecules ____ of monomers called *nucleotides.*Therefore, DNA and RNA are polynucleotides. Nucleic acids ____ the means of biochemical regulation. The monomers forming nucleic acids, the nucleotides, ____ of a five-carbon sugar, a phosphate group, and a nitrogen-containing base. A base is a substance that tends to ____ protons and will combine with acid to form a salt.) The monosaccharide ribose ____ as the sugar group for RNA (ribonucleic acid), while

deoxyribose is ____ in DNA. The bases contained in DNA – adenine, thymine, guanine and cytosine (abbreviated A, T, G, and C) are also present in RNA, with the exception of thymine, which RNA ____ with uracil (U). In both DNA and RNA the sugar and phosphate units act as the backbone of the structure, with one of the nitrogen bases ____ to each sugar. One DNA differs from another in the sequence of bases ____ to the sugar-phosphate backbone. DNA carries the genetic blueprint for the cell while RNA is the intermediary molecule that ____ the blueprint into defined amino acid sequences in proteins.

31. Prepare the text for the back translation.

32. Discuss the situations through the interpreter using the Sequence of Tenses as well as the argumentation and connective words.

1. Kinds of nucleic acids. 2. Strucrure of nucleic acids. 3. The primary and secondary structure of RNA. 4. Functions of nucleic acids in the body and in production. 5. Notion, function and variants of bases.

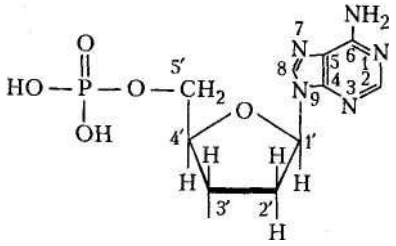
33. Translate the following text into English.

У клітинах існує два типи нуклеїнових кислот: рибонуклеїнові (РНК) і дезоксирибонуклеїнові (ДНК). Нуклеїнові кислоти так само, як і білки, потрібні для життя. З них побудований генетичний матеріал усіх живих організмів.

З'ясуванння структуру нуклеїнових кислот, зокрема ДНК, дало змогу зрозуміти, як клітини (організми) з великою точністю відтворюють себе та як у них кодується інформація, необхідна для регуляції їх життєдіяльності.

Нуклеїнові кислоти побудовані з мономерів – нуклеотидів. Нуклеотиди мають таку будову: азотиста основа вуглевод пентоза – фосфорна кислота. До складу ДНК входить чотири види нуклеотидів:

дезоксі-аденілова, дезоксигуанілова, дезокситимідилова і дезоксицитидилова кислоти, а до складу РНК також чотири види нуклеотидів: аденілова, гуанілова, цитидилова та урацилова кислоти.



Азотисті основи, які можуть утворювати водневі зв'язки, називаються комплементарними. Завдяки встановленню комплементарності основ вдалося побудувати модель молекули ДНК. Урацил, хоча і не входить до складу ДНК, може бути комплементарним до а деніну.

Згідно з тривимірною моделлю молекула ДНК складається з двох полінуклеотидних ланцюгів, які утворюють у просторі праву спіраль відносно однієї і тієї самої осі. Пентозофосфатний «кістяк» молекули знаходиться на периферії подвійної спіралі, а азотисті основи – всередині, і їх площини перпендикулярні до осі спіралі.

Синтез нікотинамідаденіндинуклеотидфосфату (НАДФ) здійснюють шляхом екстракції з дріжджів. Також використовується метод ферментативного фосфорилювання, при якому як джерело НАД-кінази використовують клітини мікробів *Brevibacterium ammoniagenesю* Методом кріогенної радіаційної полімеризації отримують іммобілізовані мікробні клітини. В реакторі періодичної дії з мішалкою чи в реакторі безперервної дії іммобілізований фермент вміщують в колонку. Після завершення процесу в реакторі кофермент, що утворити, осаджують етанолом, потім промивають ацетоном і ефіром та висушують.

LESSON 4

The Sequence of Tenses

Part I

1. Read and memorize the following words and word combinations.

muscle contraction	скорочення м’язів
release	вивільняти
wastes removal	видалення відходів
transmission	передача
digestion	травлення
yield	призводити до, мати результатом
convert	перетворювати
blood stream	потік крові
anabolic pathway	шлях анаболізму
excrete with urine	виділяти з сечею
reduce	відновлювати, розкислювати
pathway	шлях
couple	з’єднуватися
pick up	захватити
chemical bond	хімічний зв’язок
stable vehicle	стійкій засіб
energy storage	зберігання енергії
reverse	зворотній

2. Find the international words in the text and give their Ukrainian analogues.

3. Form the adjectives with the suffixes: -ive, -ex, -ent, -ar(y), -ous.

complete, differ, regulate, celle, molecule, globule, muscul, complement

phosphorus, nerve, construct, effect.

4. Form the words with the prefixes: hetero-, re-, co-, con-, com-, sur-, trans-.

act, generate, move, enzyme, chromatic, cycle, use, round, turn, amination, formation.

5. Read, translate and exemplify the text.

Anabolism, Catabolism, and Metabolism

Anabolism refers to the range of biochemical reactions that occur in living cells, in which larger molecules are synthesized from smaller ones, as in the construction of proteins from amino acids. These processes usually require energy and are therefore is used by the cells to store it. An organism's catabolism is made up of the pathways through which larger molecules are broken down into smaller ones, releasing the energy needed for muscle contraction, waste removal, transmission of nerve impulses, and all other cellular processes that demand energy. Together, an organism's anabolism and catabolism are referred to as its metabolism. A series of anabolic and catabolic processes, described below, produces the molecules ultimately used as the major source of cellular energy.

Catabolism of Simple Sugars. During digestion — the first step in the process of extracting energy from food — polysaccharides, proteins, and fats are hydrolyzed, yielding simple sugars, amino acids, and fatty acids. The catabolism of the simple sugar glucose includes a ten-step reaction known as glycolysis**,** or the Embden-Meyerhof pathway, in wnich each glucose molecule is converted into two three-carbon molecules called pyruvate. These then undergo decarboxylation (loss of carbon dioxide), forming a two-carbon acetate group, which subsequently attaches to the compound known as coenzyme A, forming acetyl coenzyme A (acetyl

CoA), a molecule essential to the further release of energy

Catabolism of Amino Acids. Each of the 20 amino acids is catabolyzed by means of its own unique pathway. In each case the molecule's nitrogen is removed, either as part of an ammonium ion (a positively charged compound of one nitrogen and four hydrogens, or NHi^{+}) or by transamination, in which the amino group (NHU) of the amino acid is transferred to a keto acid, specifically an α-keto acid, prior to being used in the formation of another amino acid. Transamination enables an organism to synthesize amino acids that may not be present in its diet. The carbon remaining from the original amino acid is used either in glycolysis or in the citric acid cycle. Ammonium ions, in contrast, are toxic and must be removed from the body. Some ammonium is excreted in the urine, but most of it is removed through the urea cycle, an anabolic pathway in the liver.

Citric *Acid Cycle.* The acetyl CoA units produced by the catabolism of the three major biochemical groups bond with oxaloacetic acid to form citric acid, the first step in a closed loop of reactions known as the citric acid, or Kreos, cycle. During each turn of this cycle, two carbon dioxides are produced and flavine adenine dinucleotide (FAD) and the ion nicotinamide adenine dinucleotide (NAD) (both of which are coenzymes) are, with the addition of hydrogen, reduced to FADH2 and NADH, respectively. The product of the final step of the cycle is oxaloacetic acid, which bonds to another acetyl CoA, starting the whole cycle again.

6. Discuss the title, the topic, and the aim of the text.

7. Answer the questions on the text.

1. What does the notion of metabolism include? 2. Is there any difference between the two metabolic processes? 3. The first step in extracting energy from food is known as digestion, isn't it? 4. What process is called glucosis? 5. What is going on with the molecule after glucosis?

6. How is nitrogen removed in the catablism of amino acids? 7. Does transamination enable an organism to synthesize dificient amino acids? 8. What substances are produced during the citric acid cycle? 9. May flavine adenine dinucleotide be the final product of the citric acid cycle?

8. Ask your own questions of different kinds on the text.

9. Sum up the text structurizing it with the introductory and connective words and learn your summary by heart.

to begin, then, after that, to continue, in conclusion, in order to, however, If, still, at this point, toward, as, following, through, during, in anticipation of, after, then, so, by comparison, as, therefore, described below, by itself, together, since, thus, nevertheless, it goes without saying, that; certainly, evidently, undoubtedly.

10. Find in the text the following word combinations and translate them into Ukrainian.

refers to, in the construction of, require energy to store it, is made up of the pathways, needed for muscle contraction, transmission of nerve impulses, demand energy, ultimately used, as the major source of cellular energy, extracting energy from food, yielding simple sugars, pass into the bloodstream, carried to the cells, undergo decarboxylation, loss of carbon dioxide, forming a group, subsequently attaches.

11. Find in the text the English equivalents of the following Ukrainian word combinations.

обсяг (кількість), зустрічатися у, відомий як, через який, розщеплюватися на, видалення відходів, називатися (відноситися) як, жирні кислоти, простіші сполуки, перетворюватися на, виділяти енергію, протягом травлення, перший крок, описаний нижче, утворювати / переносити

амінокислоту, прикріплятися до сполуки, утворює молекули.

12. Fill in the gaps.

removal, yielding, require, undergo, to store, attaches, converted, source, extracting, refer to, pathways, releasing, occur.

Anabolism ____ the range of biochemical reactions that ___ in living cells, in which larger molecules are synthesized from smaller ones, These processes usually ____ energy and are therefore is used by the cells ____ it. An organism's catabolism is made up of the ___ through which larger molecules are broken down into smaller ones, ____ the energy needed for muscle contraction, waste ____ , transmission of nerve impulses, etc. Together, an organism's anabolism and catabolism are ____ as its metabolism. A series of anabolic and catabolic processe, produces the molecules ultimately used as the major ____ of cellular energy. During digestion – the first step in the process of ____ energy from food – polysaccharides, proteins, and fats are hydrolyzed, ____ simple sugars, amino acids, and fatty acids. In the process of the simple sugar catabolism each glucose molecule is ____ into two three-carbon molecules called pyruvate. These then ____ decarboxylation, forming a two-carbon acetate group.

13. Match the synonyms.

include, happen, join, liberate, carry out, breathing, receive, split, create, disintegrate, happen, building, demand, accumulate, get, reduce, eliminate, move, transform, occur, respiration, obtain, break down, fall into, add, involve, release, drive, form, shorten, gather, convert, require, construction, break, remove, occur.

14. Match the notions and their definitions.

1) decarboxylation, acetyl CoA, digestion, transamination, ammonium ion.

2) a positively charged compound of one nitrogen and four hydrogens, the process in which the amino group (NHU) of the amino acid is transferred to an α-keto acid, loss of carbon dioxide, the first step in the process of extracting energy from food, a molecule essential to the further release of energy.

15. Explain the following notions using the text:

anabolism, catabolism, metabolism, transamination, Embden-Meyerhof pathway, piryvate, coenzyme.

16. Learn the derivatives and use them in situations.

transfer – transport – transportation – transmission – transform, oxygen – oxyde – oxygenation – oxydize – dioxyde – oxidant, carbon – carbonic – carbonize – carbonized – carbonization – carbohydrate – carboxile – carbonaze, metabolic – metabolism – metabolite – metabolize.

17. Prepare the text for the back translation.

18. Analyze tense and voice of the verbs in the text. Give their tense forms in the sentences.

19. Use the conversives in the sentences as nouns and verbs.

store, step, limit. process, call, form, release, contrast, bond, turn, transport, demand, waste, extract, yield, charge, cycle, sequence, cause.

20. Fill in the gaps with the prepositions.

at / t o / from (of), in / into / out of, on / onto / off, over / above / under / below, through / across, throughout / over, about / around, by / with.

Anabolism refers ____ the range of biochemical reactions that occur ____ living cells, ____ which larger molecules are synthesized ____ smaller ones, as ____ the construction of proteins from amino acids. These processes usually require energy and are therefore is used ____ the cells to store it. An organism's catabolism is made up

____ the smaller ones, releasing the energy needed ____ muscle contraction, waste removal. The acetyl CoA units produced ____ the catabolism ____ the three major biochemical groups bond ____ oxaloacetic acid.

21. Discuss the situations through the interpreter using the Sequence of Tenses as well as the argumentation and connective words.

1. Catabolism of simple sugars. 2.Catabolsm of amino acids. 3. Citric acid cycle. 4. Catabolism in the body and methods of its regulation. 5. Use of catabolic processes in production.

Let us review / observe / consider / regard

in view of, my point of view / my attitude / position, in my opinion / to my mind, keep in mind, give me a piece of mind

certainly, for certain,with certainty, to be certain, sure, surely, obviously

Let's suggest / imagine / suppose/ guess that, provided / in case / if we…, as far as, suppose

22. Translate the following abstract into English.

Для кожної клітини характерний обмін речовин з навколишнім середовищем. Усі реакції, які відбуваються в клітині, можна розподілити на дві групи: анаболітичні – синтез великих молекул із простих і дрібних з витратою енергії та катаболічні – реакції розщеплення великих молекул на дрібні: прості, переважно з виділенням енергії. Сукупність катаболічних і анаболічних процесів, що відбуваються в клітині, називають *метаболізмом.*

Для використання в живій клітині найпридатніша хімічна енергія, оскільки вона легко може передаватися з однієї частини клітини в іншу і витрачатися економно та певними порціями там, де в цьому є потреба. Енергія продукується під час дихання. *Диханням* називається будь-який процес, за якого окиснення органічних

речовин приводить до виділення хімічної енергії. Якщо цей процес відбувається в клітинах, його називають тканинним, або клітинним диханням, якщо для окиснення використовується кисень, то – аеробним, а якщо в реакції кисень не використовується, то – анаеробним.

Таким анаеробним механізмом продукування енергії є гліколіз.

Гліколіз – послідовність хімічних реакцій, у результаті гліколізу одна молекула глюкози розщеплюється на дві молекули піровиноградної кислоти. Гліколіз здійснюється в цитозолі клітини анаеробів та всіх вищих організмів – аеробів. Енергія, що виділяється під час розщеплення органічних речовин, акумулюється в специфічних сполуках, а вже потім використовується для різних потреб клітини. У процесі еволюції клітини виробили здатність синтезувати значну кількість сполук — акумуляторів енергії. Однією з найважливіших таких сполук є аденозинтрифосфорна кислота(АТФ).

Part II

23. Read and sum up the text.

Oxidation

Oxidation. Many of the reactions within catabolic pathways involve oxidation (the addition of oxygen to a molecule). Whether a reaction occurs in a laboratory or a living organism, every oxidation reaction must be accompanied by a reduction. In the cell certain oxidations are coupled to the reduction of NAD^+ and others to the reduction of FAD, depending on the chemical bonds being formed in the oxidized compound.

ADP to AW. The final step in the catabolism of food is the conversion of the molecule adenosine diphosphate (ADP) to adenosine triphosphate (ATP), a high-energy compound that can be used to drive

cellular reactions. By itself, ATP is a rather unreactive molecule, which makes it a stable vehicle for energy storage. The energy is released only in an enzyme-catalyzed reaction in which ATP loses a phosphate group and converts back to ADP.

The conversion of ADP to ATP occurs in a pathway called the electron transport sequence, in which electrons and protons picked up in the citric acid cycle by the coenzymes NADH and FADH2 are transferred to oxygen, releasing large amounts of energy and causing the oxygen to combine with hydrogen, forming water. Some of the energy released during the transport sequence is picked up for the conversion of ADP to ATP. The transport sequence also converts the two coenzymes back to their oxidized form, enabling them to again serve as oxidizing agents in the citric acid cycle. In the absence of oxygen most organisms have only a limited ability to extract energy from food. Essentially the reverse of carbohydrate catabolism, photosynthesis is an anabolic process.

24. Ask your own questions of different kinds on the text.

25. Make up an abstract of the text and retell it using the introductory and connective words.

26. Find in the text the following word combinations and translate them into Ukrainian.

essential catabolic pathways, involve oxidation, the addition of oxygen, a reaction occurs, accompanied by a reduction, oxidations are coupled to, depending on the chemical bonds, the final step, to drive cellular reactions, by itself, a rather unreactive molecule, makes it a stable vehicle, loses a phosphate group, called the electron transport sequence, picked up in the citric acid, are transferred to, releasing large amounts of energy, causing the oxygen to combine with hydrogen, enabling them, serve as oxidizing agents, have only a limited ability, the reverse of.

27. Find in the text the English equivalents of the following Ukrainian word combinations.

шлях катаболізму, реакція окислення, додавання кисню, залежно від, супроводжуватися редукцією, поєднуватися з, проводити реакцію, надійний засіб, може використовуватися, зберігання енергії, енергія вивільняється, переноситися до кисню, транспортний ланцюг, захоплювати електрони, обмежена здатність, добувати енергію, зустрічатися у, через який, розщеплюватися на, видалення відходів, називатися (відноситися) як, жирні кислоти, простіші сполуки, перетворюватися на, протягом травлення, перший крок, описаний нижче, утворює молекули.

28. Fill in the gaps.

reduction, storage, transferred, picked up, pathways, compound, drive, addition, released, coupled, occurs, sequence, accompanied.

Many of the reactions within catabolic ____ involve oxidation (the ____ of oxygen to a molecule). Whether a reaction ____ in a laboratory or a living organism, every oxidation reaction must be ____ by a reduction. In the cell certain oxidations are ____ to the reduction of NAD^+ and others to the ____ of FAD, depending on the chemical bonds being formed in the oxidized ____. A high-energy compound that can be used to ____ cellular reactions. ATP is a rather unreactive molecule, which makes it a stable vehicle for energy ____. The energy is ____ only in an enzyme-catalyzed reaction in which ATP loses a phosphate group and converts back to ADP.The conversion of ADP to ATP occurs in a pathway called the electron transport ____, in which electrons and protons ____ in the citric acid cycle by the coenzymes NADH and FADH2 are ____ to oxygen.

29. Prepare the text for the back translation.

30. Discuss the situations through the interpreter using the

Sequence of Tenses as well as the argumentation and connective words.

1. Notion of oxidation. 2. Conditions of oxidation. 3. Conversion of ADP to ATP.

31. Translate the following text into English.

Окиснення органічних речовин, що відбувається в клітині супроводжується виділенням хімічної енергії, називається *внутрішнім, тканинним,* або *клітинним,* диханням. Якщо для цього використовується кисень, то таке дихання називається *аеробним.* Воно притаманне аербоним прокаріотам.

Процес дихання цитологи розглядають на мікроскопічному рівні, тобто цікавляться молекулярними механізмами процесів використання кисню та утворення вуглекислого газу в клітинах. Субстратами для дихання є органічні сполуки – вуглеводи, і білки. Однак більшість клітин використовує насамперед вуглеводи. Полісахариди включаються в процес дихання лише після того, як відбувається їх гідроліз до моносахаридів.

Жири також використовуються під час дихання. У матриксі мітохондрій відбувається процес розщеплення жирних кислот. Так, довгі ланцюги жирних кислот взаємодіють з ферментом, до складу якого входить кофермент А, який позначають як КоА – SH (оскільки він містить сульфгідрильну групу – SH). Під впливом такої взаємодії жирні кислоти розщеплюються до «активної оцтової кислоти» – ацетилкоензиму А.

Оскільки білки в клітинах виконують багато життєво важливих функцій, то вони використовуються для дихання після того, як вичерпуються всі запаси вуглеводів і жирів за тривалого голодування.

LESSON 5

The Participle Functions

Part I

1. Read and memorize the following words and word combinations.

source	джерело
earth	земля
unicellular	одноклітинний
liberate	вивільняти
dark phase	темна стадія
reduced compound	відновлена, розкислена сполука
discard	відщеплювати
equation	рівняння
assign	приписувати
elucidate, lay bare	з'ясувати
divide, double, duplicate	ділитися
in order to	для того, щоб
increase, raise	збільшити
to avoid this	щоб запобігти цьому
generate, reproduce	породжувати
fertilized egg	запліднене яйце
genetic pool	генетичний набір
spindle	веретено
cleavage furrow	борозна поділу
microfilament	мікроволокно
metaphase plate	метафазна пластинка

2. Find the international words in the text and give their

Ukrainian analogues.

3. Form the verbs with the suffixes -ize, -te, -ate, -de.

catalysis, reaction, devision, excretion, deleting, transamination, hydrolysis, synthesis, organization, provision, elucidation, liberation, oxidation, separation, assimilation, translation, conjugation, replication.

4. Form the adverbs with the suffix -ly.

simple, chemical, physical, technical, simultaneous, ultimate, great, original, natural, sure, officia, useful.

5. Read, translate and comment on the text. Use the words below to read the equations.

devided by, multiplied by, added to, substracted from, is / is equal / equals to / makes / gives, to the power of.

Photosynthesis

Photosynthesis is the anabolic process by which green plants and certain green and purple bacteria use the energy of sunlight for the synthesis of organic compounds. It is the ultimate source of food for almost all organisms on earth. In this process carbon dioxide (CO_2) is the source of carbon, and water (H_2O) provides the hydrogen atoms needed to transform carbon dioxide into carbohydrates, which are the main products of plant photosynthesis and by-product – oxygen gas, liberated from water. The plant discards the oxygen as waste and stores the carbohydrate in special components called chloroplasts. Photosynthesis occurs by way of two separate chemical processes:in plants and in bacteria.

The carbon is often derived from organic acids or other simple organic compounds. The hydrogen in bacterial photosynthesis comes not from water, but from reduced sulfur compounds, hydrogen gas, or the decomposition of organic compounds. Hence oxygen is not given off in bactrterial photosynthe-

sis. The main products of bacterial photosynthesis are amino acids, proteins, and polymers of certain fatty acids.

Photosynthesis includes a dark phase and a light phase. The dark phase involves a series of enzymic reactions of assimilating carbon dioxide. The light phase includes reactions that convert the energy of sunlight into forms of chemical energy needed for carbon dioxide assimilation. Plant photosynthesis is represented by the equation of

$$(1) \quad n\,CO_2 + n\,H_2O \xrightarrow{light} (CH_2O)_n + n \cdot O_2,$$

glucose, the main carbohydrate unit of such polysaccharides as cellulose and starch that make up the bulk of plant products. Bacterial photosynthesis, the nature of which was elucidated by the American microbiologist Cornelius B. van Niel, is often represented by the equation

$$(2) \quad CO_2 + 2\,H_2S \xrightarrow{light} (CH_2O) + 2\,S + H_2O,$$

in which hydrogen sulfide (H-S), rather than water, may be the hydrogen donor with the result that sulfur, and not oxygen, is the by-product excreted or accumulated inside the bacteria.

Van Niel's work laid bare the basic similarity of bacterial photosynthesis to plant photosynthesis. By making $n = 1$ and adding one molecule of water to each side of equation 1, the equation for plant photosynthesis may be written as

$$(3)\ CO_2 - 2\,H_2O \xrightarrow{light} (CH_2O) + O_2 - H_2O.$$

Equations 2 and 3 are basically analogous and demonstrate that the overall result of photosynthesis is a light-induced oxidation-reduction reaction in which a hydrogen donor is oxidized and CO_2 is reduced. In plant photosynthesis (equation 3), in which water is the hydrogen donor, its oxidation results in the liberation (and escape) of oxygen. In bacterial photosynthesis (equation 2), in which hydrogen sulfide is the hydrogen donor, its oxidation results in the liberation of sulfur.

6. Look through the text. Discuss its title, topic, and aim.

7. Look through the text again to answer the following questions.

1. What is the function of photosynthesis in plants? 2. What chemical compounds take part in the process of photosynthesis? 3. How does hydrogen appear? 4. What are the main products of photosynthesis?
5. Does photosynthesis include many phases? What are they?

8. Ask your own questions of different kinds on the text.

9. Write the plan and retell the text.

10. Find in the text the following word combinations and translate them into Ukrainian.

the ultimate source of food, provides the hydrogen atoms, liberated from water, discards the oxygen as waste, by way of, separate chemical processes, other reduced sulfur compounds, the decomposition of organic compounds, certain fatty acids, the dark phase involves, a series of enzymic reactions, convert the energy of sunlight, needed for carbon dioxide assimilation.

11. Find in the text the English equivalents of the following Ukrainian word combinations.

засвоювати (2) енергію, кінцеве джерело, постачати атоми, необхідні для перетворення, головний продукт, побічний продукт, вивільнений з води, походити від, відновлення сполук, розклад сполук, певні жирні кислоти, темна фаза, світла фаза, включати реакцію.

12. Fill in the gaps.

degree, called, own, precursor, provide, use, occur, decomposition, convert, involve, assimilation, discard, derived, reduced.

Photosynthesis is the process by which green plants and certain green and purple bacteria ____ the energy of sunlight for the synthesis of organic compounds. The plant ____ the oxygen as waste and stores the carbo-

hydrate in special components called chloroplasts. Photosynthesis ____ by way of two separate chemical processes. The carbon is often ____ from organic acids or other simple organic compounds. The hydrogen in bacterial photosynthesis comes from reduced sulfur compounds, hydrogen gas, or the ____ of organic compounds.. Photosynthesis includes a dark phase and a light phase. The dark phase ____ a series of enzymic reactions of assimilating carbon dioxide. The light phase includes reactions that ____ the energy of sunlight into forms of chemical energy needed for carbon dioxide assimilation.

13. Match the synonyms.

final, supply, free, hardness, diverse, blow up, engage, interconnected, name, come from, degrade, make clear, show, yield, finish, variable, accomplish, involve, call, interlinked, elucidate, give, derive, link, provide, explode, demonstrate, rigidity, liberate.

14. Explain the notions using the text.

photosynthesis, chloroplast, polymers, enzyme, equation, donor, amino acids, carbohydrates, by-product., reduce.

15. Discuss the derivatives. Does the word denote / signify an object, action, process, property, person, phenomenon or other?

synthesis – synthetic – photosynthethis – photosynthetic, compose – composing – composed – composition – decomposition, transform – transforming – transformed – transformation, bacteria – bacterial – bactericide – bactericidal – bacteriological – bacteriology – bactrim.

16. Prepare the text for the back translation.

17. Analyze tense and voice of the verbs in the text. Give their tense forms in the sentences.

18. Write out the sentences wih Participle I (-ing verb form) and

Participle II (-ed verb form or the 3-rd verb form) from the text, define their functions and translate the sentences.

19. Transform the verbs into participles.

1. Organelles which take part in photosynthetic processes are called plastids. 2. Plastids are derived from the egg, or female cell, and multiply independently in the cytoplasm. 3. Some of the carotenoid pigments, or leucoplast store starch and are involved in gravitational responses. 4. Plant cells contain various types of organelles called plastids, which are involved in photosynthetic processes. 5. A good example of this is a piece of celery that becomes limp when stored in the refrigerator. 6. Mitochondrialike plastids are derived from the egg, or female cell, and multiply independently in the cytoplasm.

20. Finish the impersonal sentences.

1. It's certainly that ____ . 2. It must be that ____ . 3. It's probably that ____ . 4. It could be that ____. 5. It may be that ____ . 6. I's possibly that ____7. It might be that ____ . It's definitely not that ____ . 9. It couldn't be that ____ . 10. One can say that ____ . 13. It is quite natural that ____. 14. It is for them that ____ . 15. It is known that ____. 16. It sems that ____. 17. This is known to be ____ . 18. There is much work to do. 19.There may (must, can) be some sense in it. 20. It looks as if it were ____

21. Fill in the gaps with prepositions.

Photosynthesis is the anabolic process ____ which green plants and certain green and purple bacteria use the energy of sunlight for the synthesis of organic compounds. It is the ultimate source ____ food ____ almost all organisms on earth. ____ this process carbon dioxide (CO_2) is the source ____ carbon, and water (H_2O) provides the hydrogen atoms needed to transform carbon dioxide ____ carbohydrates, which are the main products ____ plant photosynthesis and by-product – oxygen gas, liberated ____ water. The plant stores the carbohydrate ____ chloroplasts. Photo-

synthesis occurs ____ way of two separate chemical processes. The carbon is often derived ____ organic acids or other simple organic compounds. The light phase reactions convert the energy of sunlight ____ forms of chemical energy needed for carbon dioxide assimilation.

22. Transform the non-prepositional word combinations into the prepositional ones.

organic compounds synthesis, plant photosynthesis, carbon dioxide assimilation, bacterial photosynthesis, sunlight energy, cell respiration.

23. Use the Participle as well as the argumentation and connective words in the dialogues on the following topics.

1. The notion of photosynthesis. 2. The chemical processes in photosynthesis. 3. The formulars of plant and bacterial photosynthesis.
4. The planetary importance of photosynthesis.
argue, object, agree, disagree, challenge
it's true / wrong / false, exactly / obviously / precisely so
make a decision / conclusion / mistake / agreement / attempt / an effert / an error / an experiment / a contribution to / resolution / statement
Attention! give / pay (special) attention to, attend to other people's opinion
on one hand – on the other hand
Let's specify the subject / the field of investigation.
regarding / taking into considerationthe fact that
provide, supply, ground, prove, exemplify, illustrate
supply / provide the calculations / formulas / explanations
provided / granted / if / when we take it as a truth./ take for granted

24. Translate the following text into English.

Фотосинтез (від лат. *фото* – світло та грець. *синтесиз* – з'єднання) – утворення вищими рослинами, водоростями, *фотосинтезуючими мікроорганізмами* органічних речовин за

допомогою світлової енергії, що поглинається *хлорофілом* та ін. фотосинтезуючими *пігментами.* В процесі фотосинтезу в рослині відбувається перетворення світлової енергії на енергію хімічних зв'язків; за рахунок цієї енергії рослини ростуть і розвиваються. Фотосинтез є осн. процесом новоутворення органічних речовин на Землі.

Процес фотосинтезу у вищих зелених рослин здійснюється у специфічних органелах клітин — *хлоропластах,* будова яких забезпечує просторове розділення і відповідну локалізацію речовин та реакцій. Узагальнено фотосинтез зображують рівнянням:

$$6CO_2+12H_rO \xrightarrow[\text{хлорофіл}]{\text{світло}} C_6H_{12}O_6+ 6H_2O+ 6O_2+ 2815{,}6\ \text{кДж}.$$

Кисень, що виділяється, походить з води. При бактеріальному фотосинтезі кисень не виділяється.

Процес фотосинтезу умовно поділяють на світлову і темнову стадії. Світлова стадія починається з фотохімічного розкладу води (фотолізу), що йде за участю хлорофілу і супроводиться виділенням молекулярного кисню. Молекули хлорофілу за рахунок поглинутої енергії світла переходять у збуджений стан. Збуджений хлорофіл передає електрон якомусь акцептору, що перетворюється на радикал А, негайно реагує, одержуючи електрон від певного донора. Далі відбувається ряд окислювально-відновних реакцій і фотосинтетичне *фосфорилювання,* в результаті яких утворюються $НАДФ^+$ та АТФ, де запасається енергія світла.

В результаті темнової стадії фотосинтезу відновлюється CO_3 і утворюється багато різноманітних сполук, серед яких перше місце посідають вуглеводи. Загальний фонд хлорофілу розподіляється в хлоропластах між двома фотосистемами (ФСІ та ФС II), різними за функціями, набором спектральних форм хлорофілу, акцепторами та донорами електронів. Уся поглинута енергія далі надходить до

реакційних центрів. В процесі функціонування ФС II відбувається виділення кисню. Просторово в хлоропласті обидві ФС локалізовані в різних місцях: ФС I – в міжгранних тилакоїдах і тилакоїдах гран, а ФС II – переважно у тилакоїдах гран.

Part II

25. Read sum up the text.

Cell Division

Cells must divide in order to increase their numbers. A normal cell division, called *mitosis*, results in two daughter cells, each of which has the same genetic information and number of chromosomes as the parent.

A different strategy, however, must be employed in producing male and female gametes (sex cells) for sexual reproduction. If the egg and the sperm each possessed the normal (dip-loid) number of chromosomes, the number of chromosomes in the fertilized egg would double with each generation. To avoid this and also to ensure adequate mixing of the genetic pool, the strategy of cell division by meiosis has been adopted by developing gametes. The essence of division by mitosis is the duplication and subsequent equal distribution of the amount and kind of genetic material to each of the daughter cells. This is accompanied by the division of the cytoplasm. The process of mitosis is preceded by the duplication of the DNA in each of the chromosomes.

The nucleus then undergoes a series of changes, called *prophuse,* during which the nuclear membrane breaks down, the centrioles migrate to opposite ends of the nucleus and form a mitotic spindle apparatus, and the duplicated, but still attached, chromosomes condense and move toward the equator of the mitotic spindle. The grouping ot chromosomes at the spindle‘s equator is called the metaphase plate. The nucleus is now in *metaphase.* At this point, the duplicated members of each chromosome separate from one

another and migrate toward opposite poles of the mitotic spindle. The nucleus is now in *anaphase.* Toward the end of the migration, bundles of microfilaments (actin) become aligned below the cell surface in the same plane as the metaphase plate. The nucleus is now in *telophase.* The microfilaments contract, causing a constriction in the cytoplasm called the cleavage furrow. When the cleavage furrow has completely separated the dividing cell into two parts (that is, the daughter cells), the cell has finished mitosis.

26. Ask questions of different kinds on the text.

27. Make up an abstract of the text and retell it using the introductory and connective words.

28. Find in the text the following word combinations and translate them into Ukrainian.

in order to, results in two daughter cells, in producing male and female gametes, the diploid number of chromosomes, to avoid this, to ensure adequate mixing of the genetic pool, has been adopted, subsequent equal distribution, the amount and kind of genetic material, this is accompanied by, preceded by, still attached, chromosomes condense, move toward, at the spindle‘s equator, the metaphase plate, at this point, the duplicated members, become aligned, below the cell surface, in the same plane as, the microfilaments contract.

29. Find in the text the English equivalents of the following Ukrainian word combinations.

повинна ділитися, збільшити число, названий мітозом, однакова генетична інформація, повинна застосовуватися, запліднене яйце, число хромосом, подвоюватися з кожним поколінням, рівномірний розподіл, проходить серію змін, виробляти гамети, суть ділення мітозом, протягом якої, мембрана ядра тріскається, до протилежних

кінців ядра, утворюють апарат міотичного веретена, відділятися один від одного, пучки мікроволокон, спричиняти скорочення, борозна поділу.

30. Fill in the gaps.

reduces, divisions, facing, contractile, involved, expression, destined, differentiation, reassortment, gametes, duplication, spindle

Meiosis ____ the number of chromosomes in gametes from the normal diploid (2N) number to half of that – haploid (IN). This is accomplished by a two-stage series of cell ____, a reductional division and an equational division. Following ____ of the DNA, the gametes pass through a prolonged prophase, After metaphase of the first meiotic division, one of each chromosomal pair goes to one pole of the meiotic ____ and the other goes to the opposite pole. The main result of the first meiotic division is a ____ of the genetic information. From the genetic standpoint, the haploid ____ precursors of eggs or spermatozoa, are ready to participate in fertilization. The process of specialization, called ____, is the result of unequal ____ of the genetic information contained in the nucleus. For example, a cell ____ to become a red blood cell will form mRNA's for hemoglobin, whereas a muscle cell will form mRNA's for ____ proteins. Many cellular control mechanisms are ____ in differentiation, and understanding these controls is one of the main problems ____ cell biologists.

31. Prepare the text for the back translation.

32. Use the Participle as well as the argumentation and connective words in the dialogues on the following topics.

1. The phases of the cell division. 2.The difference between the woman and man cells division. 3. The functions of meiosis and differentiation.

33. Translate the following extract into English.

Під час поділу клітина ділиться на дві дочірні клітини, ідентичні в генетичному відношенні. *Клітинний цикл* (послідовність подій поділу

клітини) еукаріотів поділяють на дві стадії: 1) мітоз – основний спосіб поділу еукаріотних клітин, в результаті якого відбувається рівномірний розподіл генетичного матеріалу ядра між двома новими клітинами; 2) інтерфаза – проміжний етап між двома послідовними мітозами, під час якого клітина готується до поділу. В період інтерфази ядерний хроматин розподіляється по всьому ядру, і хромосоми в цей період не виявляються. Інтерфазу, в свою чергу, поділяють на три періоди.

У першому періоді інтенсивно відбуваються процеси біосинтезу та утворення мітохондрій, хлоропластів (у рослин), ендоплазматичної сітки, лізосом, комплексу Гольджі, вакуолей і пухирців. Ядерце продукує рРНК, мРНК, тРНК і утворюються рибосоми. Клітина синтезує структурні й функціональні білки. Здійснюється інтенсивний клітинний метаболізм, який контролюється ферментами. Клітина росте. Утворюються речовини, що пригнічують або стимулюють початок наступної фази.

Другий період характеризується реплікацією ДНК. Посиленно синтезуються білки – гістони, з якими зв'язується кожна нитка ДНК. Одночасно синтезується РНК. Під дією розплітаючих білків у кількох місцях молекули утворюються реплікативні вилки.

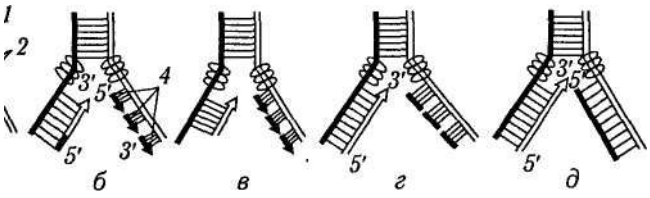


Figure 2.

Схема реплікації ДНК: 1 – батьківські ланцюги; 2 – розплітаючий білок; 3 – РНК-затравка; 4 – фрагменти Оказакі.

У третьому періоді припиняється реплікація ДНК, однак повільно продовжується синтез РНК, інтенсивно здійснюється поділ мітохондрій і хлоропластів, збільшуються енергетичні запаси клітини, реплікуються центріолі, починає формуватися веретено поділу.

LESSON 6

The Participial Complexes

Part I

1. Read and memorize the following words and word combinations.

diversity	різноманіття
move	рухатися
motility	рухливість
tap	вивільняти
extract	добувати
evolve	виробляти
nutrient	поживна речовина
surround	оточувати
state	стан
introduce	вводити
coat	оболонка
the host cell	клітина - хазяїн
impose constraints	накладати обмеження
confer on	надавати
inherent	спадковий
icosahedral	двадцятигранник
beneficial	корисний
complementary	додатковий

2. Find the international words in the text and give their Ukrainian analogues.

3. Form the nouns of professions and machines with the suffixes -er, -ent -or, -ist, -ant, -cian.

technology, physiology, chemistry, ferment, diffuse, evaporate, special,

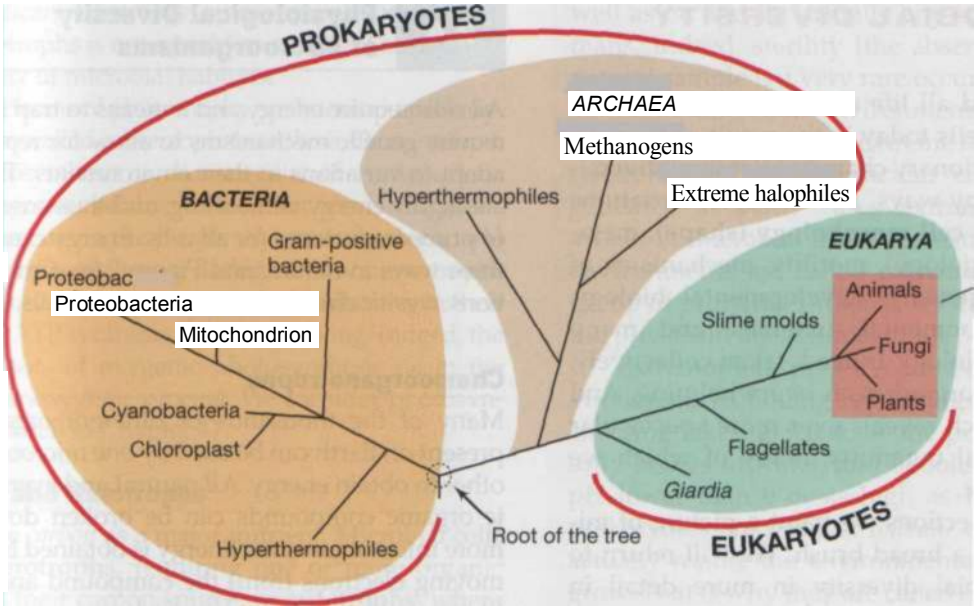


Figure 3

The phylogenetic tree of life as defined by comparative rRNA gene sequencing. The tree consists of three domains of microorganisms: the *Bacteria* and the *Aichaea,* cells of which are prokaryotic, and the *Eukarya* (eukaryotes).

operate, carry, biology, lecture, physics, manipulate, assist, study, research, discover, mix, consult, mathematics, academy, engineer, ferment, calculate, catalize, neutralize, oxidize, inhibit.

4. Form the adjectives with the suffixes: -able, -full, -ible, -uble, -ous.

phosphorus, number, danger, saponify, solution, convert, move, break, ferment, pore, ferment, apply, use, truth.

5. Study the text to describe the forms of microbial diversity. Read and translate the text.

Microbial Physiological Diversity

Microbial diversity can be seen in many ways. For example, developmental biology, adaptation to environmental extremes, and variations occur in cell size and cell morphology (shape), metabolic strategies (physiology), motility, mechanisms of cell division, pathogenicity, many other aspects of cell biology.

Microbial diversity is closely linked to *metabolic* diversity. All cells also require genetic mechanisms to allow for replication and to adapt to variations in their environments. These processes being highly energy demanding, and thus energy sources are of prime importance for all cells. Energy can be obtained in three ways in nature: *organic* chemicals, *inorganic* chemicals, or *light.* Energy being obtained by *oxidizing* (removing electrons from) the compound, it is conserved in the cell as the energy-rich compound*, adenosine triphosphate* (ATP)*.* Some microorganisms can extract energy from the compound only in the presence of oxygen; these organisms being called *aerobes.* Others can extract energy only in the absence of oxygen *(anaerobes), s*till others breaking down organic compounds in either the presence or absence of oxygen. Organisms that obtain energy from *organic* compounds are called *chemoorganotrophs*. Most microorganisms that have

been cultured are chemoorganotrophs.

Oxidation of the organic or inorganic chemicals yields ATP in chemotrophic organisms while conversion of solar energy to chemical energy (again, in the form of ATP) occurs in phototrophic organisms. A number of prokaryotes can tap the energy available in *inorganic* compounds. This is a form of metabolism called *chemolithotrophy* and is carried out by organisms called *chemolithotroph.* This form of energy-yielding metabolism is found only in prokaryotes and is widely distributed among *Bacteria* and *Archaea.* The spectrum of different inorganic compounds used is quite broad, but as a rule, a particular prokaryote specializes in the use of one or a related group of inorganic compounds.

Phototrophic microorganisms contain pigments that allow them to use light as an energy source, and thus their cells are colored. Unlike chemotrophic organisms, *phototrophs* do not require chemicals as a source of energy; ATP is made from the energy of sunlight.

Two major forms of phototrophy are known in prokaryotes. In one form, called *oxygenic photosynthesis,* O_2 is evolved. Oxygenic photosynthesis is characteristic of cyanobacteria and their phylogenetic relatives. The other form, *anoxygenic photosynthesis,* occurs in the purple and green bacteria, and does not result in O_2 evolution. Both groups of phototrophs use light to make ATP, however, and the similarities in their mechanisms of ATP synthesis are quite striking. Indeed, the evolutionary roots of oxygenic photosynthesis lie in the much simpler anoxygenic process.

All cells require *carbon* as a major nutrient. Microbial cells are either *heterotrophs,* requiring one or more organic compounds as their carbon source, or *autotrophs*, where CO_2 is the carbon source. Chemoorganotrophs are also nearly heterotrophs. By contrast, many chemolithotrophs and virtually all phototrophs are autotrophs. Autotrophs are sometimes called *primary producers* because they syntesize organic matter from CO_2 for both their own benefit and that of chemoorganotrophs. The latter either feed directly on the

primary producers or live off products they excrete. All organic matter on Earth has been synthesized by primary producers, in particular by photosynthesis, by autotrophic organisms.

6. Ask questions of different kinds on the text.

7. Write the plan of the text.

8. Write an abstract of the text.

9. Find in the text the following word combinations and translate them into Ukrainian.

developmental biology, adaptation to environmental extremes, allow for replication / to replicate, variations in their environments, highly energy demanding, of prime importance, removing electrons from, the energy-rich compound, carbon nutrient, can tap the energy available, energy-yielding metabolism, is found only in, the spectrum is quite broad, as a rule, unlike chemotrophic organisms, is characteristic of, result in O_2 evolution, the similarities are quite striking, the evolutionary roots lie in, as a major nutrient, by contrast, for their own benefit, the latter feed directly on, live off products they excrete, in particular.

10. Find in the text the English equivalents of the following Ukrainian word combinations.

механізм поділу клітини, різноманітні мікроби, вимагає генитчних механізмів, тісно пов'язана з біологією, варіації трапляються, потребувати механізму, пристосовуватися до, в їхньому оточенні, зберігатися в клітині, отримувати енергію, виділяти / видобувати енергію, присутній в органічних сполуках, метаболізм проходить, знайдений у, широко розповсюджений, широко використовується, джерело енергії, головна поживна речовина, годуватися безпосередньо.

11. Fill in the gaps.

extract, evolve, tap, yields, break, excrete, conversion, nutrient, compound, diversity.

1. Microbial ____ occurs in cell size and cell morphology (shape), etc. 2. Some microorganisms can extract energy from the ____ only in the presence of oxygen (*aerobes).* 3. Others can ____ energy only in the absence of oxygen *(anaerobes).* 4. Still others can ____ down organic compounds in either the presence or absence of oxygen. 5. Oxidation of the organic or inorganic chemicals ____ ATP in chemotrophic organisms. 6. ____ of solar energy to chemical energy occurs in phototrophic organisms. 7. A number of prokaryotes can ____ the energy available in *inorganic* compounds. 8. Phototrophy of cyanobacteria and their phylogenetic relatives is called *oxygenic photosynthesis* where O_2 is ____ . 9. All cells require *carbon* as a major ____ . 10. Chemoorganotrophs feed directly on the primary producer or live off products they ____.

12. Match the synonyms.

bacteria, environment, happen, quantity, contribute, connect, attract, supplement, species, enhance, microorganism, occur, bring in, attach, yield, draw, media, additive, kind, stimulate.

13. Explain the notions using the text.

cell shape, cell physiology, chemotrop, chemolithotrophy, chemolithotrop, phototrophs, autotrophs, heterotrophs, chemoorganotrophs, oxygenic photosynthesis, anoxygenic photosynthesis, primary producer, cell morphology, metabolic strategies (physiology).

14. Learn the derivatives and use them in situations.

autotroph – autotrophy – autotrophic – chemoorganotroph – chemolisotroph – heterotroph – phototroph, organ – organic – inorganic –

organical – organically – organism – organisation, oxide – oxidant – oxidation – oxidic – oxidize – oxidization – oxygen – oxygenic – oxigenate – dioxide – peroxide, hydrate – hydride – hydrigen – hydrogenate – hydrolysis – hydrolic – hydrofilic – hydrophobic – hydrotrophic – hydrous – hydroxide, carbon – carbohydrate – carbonation – carbonate – carbonic – carbonization – carboxide – carboxylic.

15. Prepare the text for the back translation.

16. Analyze tense and voice of the verbs in the text. Use them in the sentences.

17. Find the sentences with complex participle constructions, analyze their subject-predicate relations and translate them into Ukrainian.

18. Transform the following sentences into participial complexes.

Model 1. The hyposis seemed convinsing, the result proving it.

Model 2. The idea being clear, it requires no illustrations.

Oxidation of the organic or inorganic chemicals yields ATP in chemotrophic organisms while conversion of solar energy to chemical energy occurs in phototrophic organisms. A number of prokaryotes can tap the energy which is available in *inorganic* compounds. This is a form of metabolism called *chemolithotrophy* and is carried out by organisms called *chemolithotrophs.* This form of energy-yielding metabolism is found only in prokaryotes and is widely distributed among *Bacteria* and *Archaea.* The spectrum of different inorganic compounds used is quite broad, but as a rule, a particular prokaryote specializes in the use of one or a related group of inorganic compounds. Phototrophic microorganisms contain pigments, and thus their cells are colored. Unlike chemotrophic organisms, *phototrophs* do not require chemicals as a source of energy; ATP is made from the energy of sunlight.

19. Fill in the gaps with the missing prepositions and conjunctions.

in, of, also, for, by, which, at, either or, to, with, who, of, so as, and.

1. Young people ____our country have every opportunity to study ____ to get a higher education.2. Students ____ the day department get scholarships. 3. Students can find all the books necessary ____ their studies ____the libraries and reading rooms ____ their institutes. 4. They can ____ make experiments, carry out research work and different kinds

of practical work ____ the laboratories and workshops of. 5. To enter an institute you have to take entrance examinations ____ are rather difficult. 6. Students are able to study ____ ____ the evening ____ day departments. 7. There are full-time students, part-time student, extramural students ____ study ____ correspondence. 8. The training of specialists ____ our institutes combines theoretical studies ____ practical work industrial training. 9. ____ the end of each term students have to take their examinations ____credit tests. 10.The main task of higher school is to give profound theoretical knowledge and practical skills ____ students.

20. Discuss the situations using participles and their complexes as well as the argumentation and connective words.

1.Grounds for microbial classification. 2. Oxidation in procariots and eucariots. 3. Ways of obtaining energy by micrrorganisms. 4. Kinds of photosynthesis. 5. The notion of primary producer.

allow me, let me, can I, could I, if I might, I would like to know, I wonder / ask / question whether / if

raise a question, The question arises. That's out of question.

I raise my voice in favour of / poin out, the point is, the remark is pointles, I'd like to point out that, that's to the point

reach one's aim / conclusion / end / object / purpose, hit the point

21. Translate the text into English.

Бактерії за формою поділяються на кілька груп: сферичні, спіральні, циліндричні, незвичної форми та нитчасті.

Сферичні бактерії, або *коки* (від *грец.* kokkos – зерно) мають округлу форму. Залежно від розташування клітин після їх ділення поділяються на групи: м*ікрококи (Micrococcus)* (від *грец.* micros – малий) – КОКИ, що діляться в одній площині і після поділу розміщуються поодиноко, наприклад, *Micrococcus aqua* – звичайний мешканець води *(Micrococcus*– назва роду; *(aqua* – видова назва). *Диплококи (Diplococcus)* (від *грец.* diplos – подвійний) *, стрептококи (Streptococcus)* (від *грец.* streptos – ланцюжок). *Стафілококи Staphylococcus)* – коки, що діляться в кількох площинах.

Циліндрична форма бактерій (від *грец.* bacteria, *лат.* bacillum – паличка) є характерною для більшості бактерій. Паличкоподібні бактерії поділяються на такі, що утворюють ендоспори *(Bacillus, Clostridium),* і на такі, що не утворюють ендоспор, довгі, короткі, дуже короткі (менше 1 мкм), тонкі і товсті Розміщуються палички поодиноко, по дві клітини, ланцюжками, під кутом одна до одної, утворюючи фігури, подібні до X чи V, наприклад, артробактерії, корінебактерії, нокардії, мікобактерії.

Бактерії спіральної форми розрізняються за кількістю і характером завитків, довжиною та товщиною клітин. Іх можна поділити на форми, що не гнуться (вібріони, спірили), і на такі, що вигинаються (спірохети). *Вібріони* мають вигляд зігнутої палички чи коми .*Спірили* – спірально вигнуті клітини

Нитчасті форми бактерій: трихомні, – це здебільшого паличкоподібні клітини, з'єднані в довгі ланцюжки, які об'єднані слизом, чохлами-шхвами, плазмодесмами (місточками) або єдиною оболонкою.

Всі бактерії характеризуються постійністю форми клітини завдяки особливостям будови клітинної стінки. Але є бактерії, для яких характерним є поліморфізм. Розміри бактеріальних клітин сильно варіюють. Діаметр сферичних бактерій становить від 0,2 до 2,5 мкм. Найменшими є

мікоплазми – 0,15 мкм.

Part II

22. Remember the following terms and their definitions.

Pathway for example, a series of steps that leads to virus replication.

Phage a virus that infects cells of two or more identical linear acid molecules in tandem; in virology, refers to a virus a lipoprotein membrane surrounding the virion

Retrovirus a virus whose RNA genome has a DNA intermediate as part of its replication cycle

Reverse transcription the process of copying information found in RNA into DNA by the enzyme reverse transcriptase

Transformation in eukaryotes, a process by which a normal cell becomes a cancer cell.

Virion the complete virus particle; the nucleic acid surrounded by a protein coat and in some cases other material

Virulent virus a virus that lyses or kills the host cell after infection; a nontemperate virus

Virus a genetic element containing either RNA or DNA that replicates in cells but is characterized by having an extracellular state

Viroid small, circular, single-stranded RNA that causes various plant diseases, an organism that has developed moral requirement through mutation.

23. Read and sum up the text.

General Properties of Viruses

Viruses can exist in either extracellular or intracellular forms. In the *extracellular* form, a virus is a minute particle containing nucleic acid (DNA or RNA) surrounded by protein and, occasionally, depending on the specific

virus, other macromolecules. In the extracellular form, the virus particle, also called the *virion***,** is metabolically inert and does not carry out respiratory or biosynthetic functions. The virion is the structure by which the virus genome moves from the cell in which it has been produced to another cell where the viral nucleic acid can be introduced. Once in the new cell, the *intracellular state* is initiated. In the intracellular state, virus replication occurs: new copies of the virus genome are produced, and the components that make up the virus coat are synthesized.

Viruses are genetic elements that replicate independently of a cell's chromosome(s) but not independently of cells themselves.

Unlike genetic elements such as plasmid, viruses have an *extracellular form* which unables them to exist outside the host for long that facilitates transmission from one host to another. In order to multiply, viruses must enter a cell in which they can replicate, a process called *infection***.** The cell is called *the host*. The study of viruses is a *dis*cipline of microbiology called *virology*.

Like plasmids and some other genetic elements of the metabolic machineryof the, viruses can confer important news on their host cell. These properties will be inherent. The host cell divides if each new cell also have a viral genome. These changes may even be beneficial. Viruses can replicate that is destructive to the host cell. Some viruses are agents of disease.

The differences between prokaryotic cells and eukaryotic cells impose some constraints on the viruses that infect them. Viruses of procariotes are known that infect *Bacteria* and those that infect *Archaea.* Most known bacterial viruses DNA genomes. There are many bacteriophages with other genomes. The simplest are those with RNA.

Many bacteriophages contain genomes of the plus configuration. In such viruses the viral *genome* – plus strand RNA – and the *mRNA* are of the same complementarity. Interestingly, RNA viruses of the enteric bacteria

group infect only bacterial cells that contain a type of plasmid, called a *conjugative plasmid,* which allows the bacterial cell to function as a *donor* in the process of conjugation. The bacterial RNA viruses are all quite small, about 25 ran in size, and they are all icosahedral with 180 copies of coat protein per virus particle. The complete nucleotide sequences of several RNA phage genomes are known. For example, the genome of the RNA phage MS2, which infects *Escherichia coli,* is 3569 nucleotides long.

24. Ask questions of different kinds on the text.

25. Make up an abstract of the textand retell it using the introductory and connective words.

26. Find in the text the following word combinations and translate them into Ukrainian.

a minute particle, surrounded by protein, depending on the specific virus, carry out respiratory functions, can be introduced, the *intracellular state* is initiated, virus replication occurs, new copies are produced, make up the virus coat, replicate independently of a cell, in order to multiply, can confer important news on, their host cell, the changes may even be beneficial, the process of conjugation, nucleotide sequences.

27. Find in the text the English equivalents of the following Ukrainian word combinations.

існувати у внутриклітинный формі, містити нуклеінову кислоту, маленька часточка, оточена протеїном, залежати від, рухатися з, яка називається віріон, стадія розпочинається, реплікація має місце, на відміну від, поза хазяїном, полегшує перехід, входити до клітини, врождені якості, складає оболонку, клітина – хазяїн ділиться, перехід від одного до іншого, руйнує клітину – хазяїна, носій хвороби, накладати обмеження на, дозволяи функціювати, послідовність геномів.

28. Fill in the gaps.

surround, inherent, exist, host, particle, state, replicate, confer, move, coat.

Viruses can ____ in either extracellular or intracellular forms. In the *extracellular* form, a virus is a minute particle containing nucleic acid (DNA or RNA) ____ by protein. In the extracellular form, the virus ____, also called the *virion***,** is metabolically inert and does not carry out respiratory or biosynthetic functions. The virion is the structure by which the virus genome ____ from the cell in which it has been produced to another cell where the viral nucleic acid can be introduced. In the intracellular ____ virus replication occurs: new copies of the virus genome are produced. The components that make up the virus ____ are synthesized.a process called *infection***.** The cell is called *the* ____. Viruses are genetic elements that ____ independently of a cell's chromosome(s) but not independently of cells themselves. Like plasmids and some other genetic elements of the metabolic machinery of the, viruses can ____ important news on their host cell. These properties will be ____.

29. Match the notions and their definitions.

1) hereditory, motility, virion, photosynthesis, oxidizing, template, genome, virus.

2) a genetic element containing either RNA or DNA**;** pattern or gauge used as a guide; passed on from parent to child, from one generation to the following generations; set of genes; the complete extracellular virus particle; ability to move; removing electrons from; ATP; energy yielding process.

30. Prepare the text for the back translation.

31. Discuss the situations using participles and their complexes as well as the argumentation and connective words.

1. Forms of viruses. 2. The notion of virion. 3. The differences between

prokaryotic cells and eukaryotic cells. 4. Viruses of procariotes. 5. Use of microbes in production. 6. Medical and peoples' methods fighting viral and microbial infection.

32. Translate the following text into English.

Віруси – паразитичні живі системи доклітинної будови. Віруси існують в позаклітинній та внутришньоклітинній формі. Розмірами віруси значно менші від бактерій і майже всі проходять крізь бактеріальні фільтри. Прості віруси в позаклітинній формі містять нуклеїнову кислоту – ДНК чи РНК, оточену білком та іншими макромолекулами. У простих вірусах розрізняють два морфологічні компоненти: к а п с и д – білкова оболонка, що складається з окремих субодиць та внутрішній вміст утвореного капсидом каналу – НК. У складних вірусів розрізняють ще зовнішні оболонки (у деяких вірусів) та хвостові відростки (у бактеріофагів, або фагів).

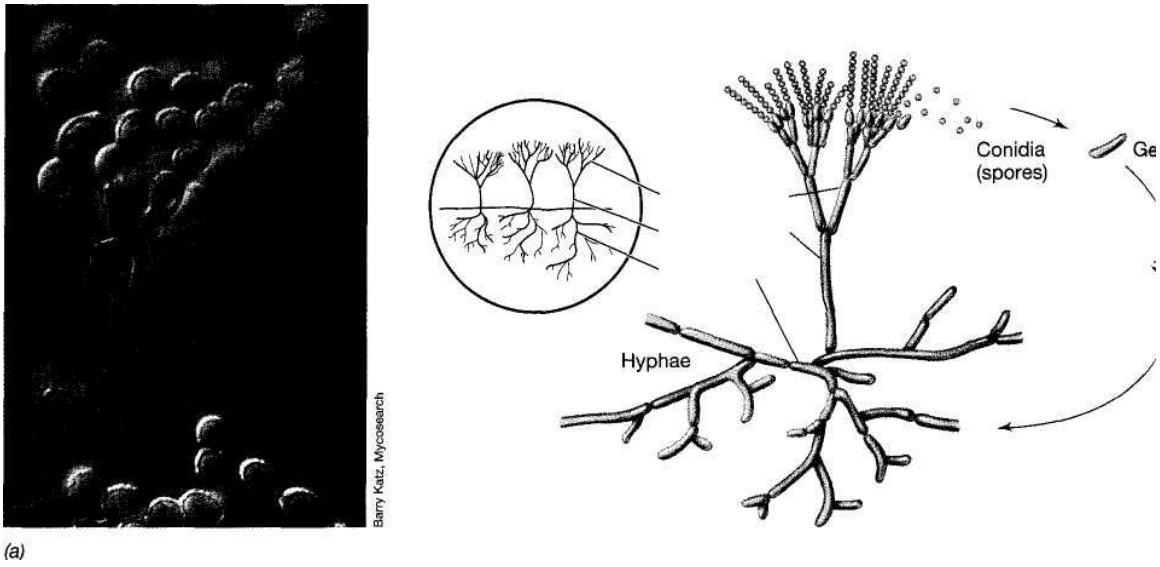
Форма вірусів досить різноманітна. Вірусам притаманна правильна геометрична будова. В позаклітинній формі вірус метаболічно інертний. Репродукція (розмноження) вірусів – складний процес формування позаклітинних часток їх – віріонів – з нарізно синтезованих НК і білка. В цьому процесі розрізняють такі послідовні стадії – адсорбція віруса – (осідання на поверхні клітини-хазяїна), проникнення в клітину, депротеїнізація вірусної НК (втрата білкової оболонки), латентний (прихований) період, коли в клітині відбуваються *реплікація, транскрипція* вірусної НК і синтез вірусних білків, потім – формування вірусів і вихід їх з клітини. Вірусам притаманні такі властивості живого, як спадковість і мінливість. Віруси уражують рослини, тварин та людину, спричинюючи вірусні хвороби.

LESSON 7

The Participial Complexes

1. Read and memorize the following words and word combinations.

fungi (одн. fungus)	гриби
resemble	нагадувати
yeasts	дріжджі
soil	почва
tufts, bundles	пучки
extensive uses	широке вживання
nutritional requirements	потреби харчування
environmental extremes	екстремальні умови
coupled with	разом з, у з'єднанні з
ubiquitous	всюдисущій
filamentous	волокнистий
mature	зрілий
budding	брунькування
acellular slime molds	неклітинна слизьова пліснява
decaying litter	мусор, що розкладається
ingest	вводити
maintain themselves	підтримуватися
vegetative state	вегетативний стан
remain dormant	залишатися сплячими
germinate	проростати
mat	плетіння, плетена структура
haploid swarm cells	маса гаплоїдних клітин
trigger	запускати
phenority	схожість
attraction	тяжіння



(a) (b)

Figure 4

Photomicrograph of a typical mold. Conidia are seen as the spherical structures (a) aerial hyphae. (b) Diagram of a mold life cycle. Conidia can be either wind-blown or be transported by animals.

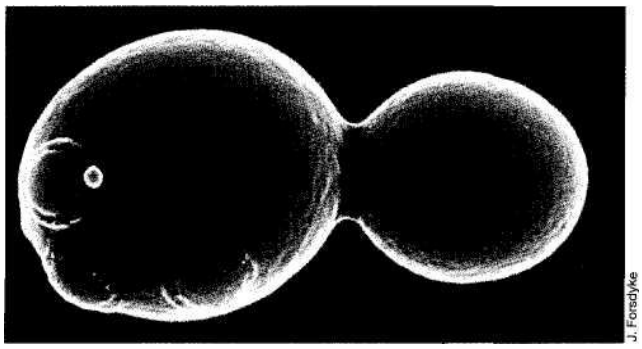


Figure 5

Scanning electron micrograph of the common baker's and brewer's yeast *Saccharomyces cerevisiae.* Note the budding

acquire	набувати
facultative	типовий
sequence	послідовність

2. Find the international words in the text and give their Ukrainian analogues.

3. Form the nouns with the suffixes: -elle, -th, -ure, -y, -ate, -ase, -ive, - al, -ance, -id(e), -ine, -ity.

organ, grow, long, press, physiological, autonomous, autotrophic, biological, similar, structural, mix, natural, phosphor, hydrogen, oxygen, nitrogen, amine, sulphur, carbon, nucleus, ribonucleic, oxyribonucleic, derive, dispose, plasma, active, carotene, sulfide, lipase.

4. Form the words with the prefixes: proto-, under-, inter-, a-, sur-, uni- , co-, bi-, poly-.

plasm, go, type, face, polar, cross, operate, sexual, type, rise, mine, estimate, stand, round, live, partner, saccaride, phosphat.

5. Read and analyze the complex words.

N-acetylglucosamine, microfibrillar, polysaccharide, polyphosphates, biotechnological, chemoorganotroph.

6. Scan the text to compare the characteristics of the microorganisms mentioned. Read and translate the text.

Fungi and Molds

Nearest to the protozoa, fungi contain cell walls and spores, among many other differences. Two groups of fungi are recognized: the *molds,* and the *mushrooms.* Fungi inhabit soil or dead plant matter and play crucial roles in the mineralization of organic carbon. Fungi are parasites of terrestrial plants and animals. Fungi include commercial genera: *Penicillium,*

Aspergillus, Saccharomyces, Candida.

Fungal cell walls resemble plant cell walls architecturally, but not chemically. Although the plant cell wall polysaccharide cellulose is present in the walls of certain fungi, most fungi contain chitin, a polymer of the glucose derivative, N-acetylglucosamine, in their cell walls. The chitin is laid down in microfibrillar bundles like cellulose; other polysaccharides such as mannans, galactosans, and chitosans replacing chitin in some fungal cell walls.

Fungal cell walls are typically 80-90% polysaccharide, with proteins, lipids, polyphosphates, and inorganic ions making up the wall-cementing matrix. An understanding of fungal cell wall chemistry is important because of the extensive biotechnological uses of fungi. The chemical nature of the fungal cell wall has been used in classifying fungi for research and industrial purposes.

Being chemoorganotrophs fungi typically have simple nutritional requirements. Many fungi can grow at environmental extremes of low pH or high temperature (up to 62° C) and this, coupled with the ubiquitous nature of fungal spores, makes these organisms common contaminants of food products, microbial culture media, and surfaces.

From the fungal mycelium, spores called *conidia* are formed. Conidia are *asexual* spores (their formation does *not* involve the fusion of gametes), Some molds also produce *sexual* spores for result of sexual reproduction. This occur from the fusion either of unicellular games specialized hyphae called *gametangia.* Alternative dual spores can originate from the fusion of two cells to yield a diploid cell, which then undergoes mitosis to yield individual spores. Spores formed are called *ascospores, or basidiospores*. *Zygospores,* produced by zygomycetous like the common bread mold *Rhizopus,* are visible structures that result from the fusion and genetic exchange. Eventually the zygomycetous matures and produces asexual spores transfered by air and germinate to form new fungal mycelium.

Molds are microbial eukaryotes that have phenority to both fungi and

protozoa. Like fungi, slime molds undergo a life cycle and produce spores. However, like protozoa molds are motile and can move across a space rather rapidly. Molds are divided into two groups, the molds, whose vegetative forms are amoebae, and the acellular slime molds, whose forms are masses of protoplasm called *plasmodia.* In the vegetative phase, acellular slime molds such as *Physarum* exist as a mass of expanding protoplasm of indefinite size, living primarily on decaying plant matter, litter, logs, and soil. Their food consists of other microorganisms, especially bacteria, which they ingest by phagocytosis. Slime molds can maintain themselves in a vegetative state for long periods but eventually form differentiated spores like structures that can remain dormant and then germinate later to once again generate the active amoeboid state.

The molds *are filamentous fungi.* They are widespread in nature and are commonly seen on stale bread, cheese, or fruit. Most molds are obligate aerobes. Each filament grows mainly at the tip, by extension of the terminal cell. A single filament is called a *hypha* (plural, *hyphae*). Hyphae usually grow together across a surface and form compact tufts, collectively called a *mycelium*, which can be seen easily without a microscope. The mycelium arises because the individual hyphae form branches as they grow, and these branches intertwine, resulting in a compact mat. In most cases, the vegetative cell of a fungal hypha contains more than one nucleus – often hundreds of nuclei are present. Thus, a typical hypha is a nucleated tube containing cytoplasm (referred to as *coenocytic*).

The acellular slime mold plasmodium is genetically *diploid.* From this mass of protoplasm a sporangium and *haploid* spores can be produced. Under favorable conditions, spores germinate to yield haploid swarm cells, the fusion of two swarm cells then regenerating the diploid plasmodium.

Dictyostelium discoideum is a cellular slime mold. As cells of *Dictyostelium* become starved, they aggregate and form a *pseudoplasmodium,* a structure in which the cells lose their individuality but

do not fuse. This aggregation is triggered by the production of two compounds, *cyclic adenosine monophosphate* (cAMP) and a specific glycopro tein, both of which functioning as chemotactic agents. Those cells that are the first to produce these compounds become centers for the attraction of other vegetative cells, leading to aggregating masses of cells that come together to form a slimy migrating mass called a *slug.*

7. Ask questions of different types on the text.

8. Write the plan of the text.

9. Write an abstract of the text and retell it.

10. Find in the text the following word combinations and translate them into Ukrainian.

fungal cell walls, is laid down, in microfibrillar bundles, like cellulose, make up, the wall-cementing matrix, because of the extensive uses, have simple nutritional requirements, at environmental extremes, coupled with, ubiquitous nature of, have phenority to, undergo a life cycle, move rather rapidly, acellular slime molds, called *plasmodia,* expanding protoplasm, decaying plant matter, especially bacteria, ingest by phagocytosis, maintain themselves, form differentiated spore, can remain dormant, generate the active amoeboid state, compact tufts, resulting in a compact mat, haploid swarm cells, aggregation is triggered.

11. Find in the text the English equivalents of the following Ukrainian word combinations.

промисловий рід грибка, певні грибки, похідний глюкози, закладений у, пучки мікроволокон, такий як, замінювати хітин, складати матрицю, для потреб дослідження, низьке pH, разом з, звичайні забруднювачі, середовище культури, на засадах фізіології, різноманітний набір, мати схожість із, бути рухомим, існувати як, у рослинній фазі, невизначеного розміру, споживати бактерії,

підтримувати себе у стані, проростати пізніше, продукувати стан, широко розповсюджена у природі, несвіжий хліб, рости на поверхні.

12. Fill in the gaps.

derivative, maintain, resemble, fungi, nutritional, tufts, triggered, conditions, slug, filamentous, starved, extension, dormant, germinate, hyphae, motile, ingest.

Nearest to the protozoa, ____ contain cell walls and spores. Fungal cell walls ____ plant cell walls architecturally, but not chemically. Most fungi contain chitin, a polymer of the glucose ____ , N-acetylglucosamine, in their cell walls. Fungi are chemoorganotrophs and typically have simple ____ requirements. The molds *are* ____ *fungi.* A single filament is called a ____ . Hyphae usually grow together across a surface and form compact ____. Like protozoa molds are ____ and can move across a space rather rapidly. They ____ their food by phagocytosis. Slime molds can ____ themselves in a vegetative state for long periods. Slime molds can remain ____ and then ____ later to once again generate the active amoeboid state. Each filament grows mainly at the tip, by ____ of the terminal cell. Under favorable ____ , spores germinate to yield haploid swarm cells. As cells of *Dictyostelium* become ____ , they aggregate and form a *pseudoplasmodium*. This aggregation is ____ by the production of two compounds, *cyclic adenosine monophosphate* (cAMP) and a specific glycoprotein. A slimy migrating mass of a mold is called a ____ .

13. Give synonyms of the words.

kind, possess, tuft, join, albumin, essential, wide, aim, need, add, pollutant, usual, various, real, species, have, requirement, protein, vast, contaminant, purpose, diverse, unusual, important.

14. Learn the derivatives and use them in situations.

bacteria – bactrial – bactericide – bactericidal – bacteriological –

bacteriology – bactrim, move – moving – movable – remove, motile – motility, filament – filamentous, grow – growth – grown-up, microbe – microbial – microchemical – microchemistry, microscope – microscopic – microscopy, fibre – fibrillar – fibrin – fibrinogen – fibrous.

15. Find in the text the words to match the notions.

polysaccharides that replace chitin in some fungal cell walls, common contaminants of food products, masses of protoplasm, filamentous fungi, a single filament of a mold, compact tufts of a mold, a structure compounds, asexual spores which formation does not involve the fusion of gametes unicellular games, specialized hyphae from the fusion of two cells to yield a diploid cell, individual spores as a result of mitosis.

16. Explain the notions using the text.

fungi, genera, *Penicillium, Aspergillus, Saccharomyces,* Candida, chemoorganotrophs, diploid, haploid spores, coenocytic, *Dictyostelium discoideum,* cAMP, *Zygospores, conidia*, *Rhizopus,* aggregation, phenority.

17. Prepare the text for the back translation.

18. Analyze tense and voice of the verbs in the text. Use them in the sentences.

19. Find in the text participles and participial complexes and analyse the sentences with them.

20. Fill in the gaps with the prepositions and conjunctions.

however, across, by, because of, on, into, after, whose, instead of, as, in, of, with, as well as, for, at,

Most fungi contain chitin ____ their cell walls. Fungal cell walls are typically 80-90% polysaccharide, ____ proteins, lipids, polyphosphates, and inorganic ions making up the wall-cementing matrix. An understanding

____ fungal cell wall chemistry is important. ____ the extensive biotechnological uses ____ fungi. The chemical nature of the fungal cell wall has been used ____ classifying fungi ____ research and industrial purposes. Many fungi can grow ____ environmental extremes of low pH or high temperature (up to 62° C) and this, coupled _____ the ubiquitous nature of fungal spores, makes these organisms common contaminants of food products.

21. Make up one sentence of two by complex participle construction.

1. Two major forms of phototrophy are known in prokaryotes. In one form, called *oxygenic photosynthesis,* O_2 is evolved. 2. Oxygenic photosynthesis is characteristic of cyanobacteria and their phylogenetic relatives. 3. The other form, *anoxygenic photosynthesis,* occurs in the purple and green bacteria. It does not result in O_2 evolution. 4. Both groups of phototrophs use light to make ATP, however, and the similarities in their mechanisms of ATP synthesis are quite striking. 5. Though the oxygenic photosynthesis seems to be a complex process, indeed, its evolutionary roots lie in the much simpler anoxygenic process. 6. *Chemoorganotrophs* are one of the simple organisms, they obtain energy from *organic* compounds. 7. Many icroorganisms have been cultured, most of them are chemoorganotrophs.

22. Discuss the situations using paricipies, their complexes as well as argumentation and connective words.

1. Fungi genera. 2. Fungal cell walls structure. 3. Fungi as food processors and contaminants. 4. The difference and similarity between mushrooms and fungi. 5. Groups of molds.

raise a claim / question / issue. It's an open question

look, sight, It is worth while looking into the details, at the first sight, have an insight into

judging / proceeding from the fact that

What's the aim / goal / task / purpose / sense / reason of your research? It's an aimless job. Set concrete tasks.

There is every reason to accept it.Your question is reasonable / unreasonable. There is no sense / reason in arguing the question. It's sensless.

23. Translate the abstract into English.

Гриби – група безхлорофільних організмів. Гриби – *гетеротрофи,* живляться органічними речовинами осмотично (адсорбтивие живлення), дістаючії їх або з неживого субстрату – *сапрофіти,* або з живих організмів – *паразити.* Гриби містять білки, жири, вітаміни різних груп, ферменти, біологічно активні речовини.

Вегетативне тіло грибів складається з міцелію *(грибниці),* тобто сплетення нитчастих *гіф.* Розмноження – нестатеве (вегетативне) і статеве. При вегетативному розмноженні ізольована частина грибниці може продовжувати розвиток: у гіфах з'являються численні перегородки, що ділять їх на окремі клітини, які оформлюються як спори – тонкостінні *(оїдії,* артроспори) або товстостінні, здебільшого забарвлені (хламідоспори); при проростанні їх утворюється грибниця. У деяких грибів відоме й *брунькування.* Статеве розмноження полягає в злитті гаплоїдних гамет різних статевих знаків з утворенням *зиготи.*

Пліснява відноситься до евкаріотів і нагадує як грибки, так і паразитів. Подібно до грибків, пліснява має життєвий цикл та виробляє спори. Подібно до паразитів, пліснява рухома. Пліснява може мати форму амеби, а неклітинна слизьова пліснява являє собою масу протоплазми, яка називається *plasmodia.* Слизьова пліснява живе на рослинних речовинах, що розкладаються. Вона споживає бактерії у процесі фагоцитозу. Пліснява відноситься до філаментарних грибів і складається з гіф.

Part II

24. Read and sum up the text.

Unicellular Fungi: Yeasts

Yeasts are single-celled, colorless plants, true fungi, with round or oval cells much larger than bacteria, found in nature on the fruit and leaves of plants and in the soil.

The yeasts are *unicellular fungi,* and most of them belong to the *Ascomycetes*. Yeast cells are typically spherical, oval, or cylindrical, and cell division typically takes place by budding. In the budding process, a new cell forms as a small outgrowth of the old cell; the bud gradually enlarges and then separates. Although most yeasts reproduce only as single cells, some yeasts can form filaments as well. In these species, certain characteristics may be expressed only by the filamentous form. For example, the filamentous phase is essential for pathogenicity in *Candida albicans,* a yeast that can cause vaginal, oral, or lung infections and, in acquired immunodeficiency (AIDS) patients, systemic tissue damage.

Yeast cells are typically much larger than bacterial cells and can be distinguished microscopically from bacteria by their larger size and by the obvious presence of internal cell structures, such as the nucleus. Some yeasts exhibit sexual reproduction by a process called *mating,* in which two yeast cells fuse. Within the fused cell, called a *zygote,* ascospores are eventually formed.

Yeasts flourish in habitats where sugars are present, such as fruits, flowers, and the bark of trees. Most yeasts are facultative aerobes, capable of fully aerobic as well as fermentative metabolism. A number of yeast species are associate symbiotically with animals, especially insects, species are pathogenic for animals and humans. The most important commercially are the baker's and brewer's yeasts, which belong to the genus *Saccharomyces*. The habitats of these yeasts were undoubtedly fruit

juices. But the commercial yeasts of today are quite different from wild strains because they have been greatly improved through the years by collection and genetic manipulation by industrial biologists. The yeast *S. cerevisiae* – model eukaryote for many years was the first eukaryote to have its genome sequenced.

25. Ask questions of different kinds on the text.

26. Write an abstract of the text using the introductory and connective words, learn it by heart and retell.

27. Find in the text the following word combinations and translate them into Ukrainian.

true fungi, budding process, small outgrowth, the bud gradually enlarge, form filaments, express certain characteristics, essential for, acquired immunodeficiency, systemic tissue damage, distinguished microscopically from, exhibit sexual reproduction process, fused cell, called *mating*, flourish in habitats, belong to the genus, greatly improved, through genetic manipulation, have its genome sequenced.

28. Find in the text the English equivalents of the following Ukrainian word combinations.

одноклітинні гриби, справжні грибки, утворювати відросток, брунька відділяється, відтворюватися тільки, відображуватися у формі, утворювати волокна, спричиняти інфекцію, придбаний імунодефіцит, відрізнятися від бактерії, наявність внутрішніх структур, клітини зливаються, спричиняти руйнування тканин, належати до, часом утворюються, здатні на метаболізм, ряд видів дріжджів, утворюються від штамів, місце існування, значно поліпшені.

29. Fill in the gaps.

filamentous, fuse, flourish, distinguished, outgrowth, ascospores,

habitats, exhibit, improved, internal, yeasts, ingest, budding, sequenced, soil, belong.

____ are single-celled, colorless plants, true fungy. Yeasts are found in nature on the fruit and leaves of plants and in the ____. The yeasts are ____ *fungi,* and most of them ____ to the Ascomycetes. Cell division typically takes place by ____ . In the budding process, a new cell forms as a small ____ of the old cell. Some yeasts can form ____ as well. Yeast cells can be ____ microscopically from bacteria by their larger size and by the obvious presence of ____ cell structures, such as the nucleus. Some yeasts ____ sexual reproduction by a process called *mating,* in which two yeast cells ____. Within the fused cell, called a *zygote,* ____ are eventually formed. Yeasts ____ in habitats where sugars are present, such as fruits, flowers, and the bark of trees. The ____ of these yeasts were undoubtedly fruit juices. Yeasts have been greatly ____ through the years by collection and genetic manipulation by industrial biologists. The yeast *S. cerevisiae* was the first eukaryote to have its genome ____ .

30. Match the notions and their definitions.

1) hypha, pseudoplasmodium, molds, plasmodium, Dictyostelium discoideum, plasmodia, glycoprotein, plasmodia.

2) a cellular slime mold, microbial eukaryotes, compact tufts, masses of protoplasm, a single filament of a mold, a structure in which the cells lose their individuality but do not fuse, chemotactic agents, masses of protoplasm.

31. Prepare the text for the back translation.

32. Discuss the situations using the participles and paricipial complexes, as well as the argumentation and connective words.

1. Properies of yeasts. 2. Yeasts sources. 3. Yeasts nutritional value and commercial application. 4. Kinds of yeasts and their growth media.

33. Translate the text into English.

Дріжджі. До цієї групи мікроорганізмів належать група еукаріотних мікроорганізмів - мікроскопічні одноклітинні гриби, які розмножуються переважно брунькуванням або поділом. Окремі види дріжджів здатні в певній фазі розвитку утворювати міцелій. До грибів дріжджі зараховують на основі ряду характерних ознак: наявність ядра, відсутність фотосинтезувальних пігментів і рухомості, наявність глікогену як запасної речовини.

Дріжджі відрізняються за формою вегетативних клітин, статевих спор і культуральними ознаками. Можуть розвиватись в аеробних та анаеробних умовах. Клітини дріжджів мають різноманітну форму круглу, овальну, яйцеподібну, циліндричну, трикутну,ін. Для деяких дріжджів форма клітин може бути використана для встановлення їх родової належності. Розміри дріжджових клітин також варіюють у широких межах. Розмножуються дріжджі *безстатевим* (брунькування, поділ, безстатеві спори) і *статевим способами.* Найпоширенішим способом безстатевого розмноження дріжджів є брунькування На поверхні клітини утворюється брунька, яка збільшується до розмірів материнської клітини і відділяється від неї, залишаючи шрам або рубець. На одній материнській клітині може утворюватися не одна, а кілька бруньок. Таке брунькування називають множинним.

Як і всім грибам, дріжджам притаманний адсорбційний тип живлення. Більшість з них є сапрофітами: існують у філосфері та ризосфері рослин, грунті, морській і прісній воді, інших природних субстратах. Розвиваються дріжджі також у шлунково-кишковому тракті, на поверхні шкіри тварин.

LESSON 8

The Infinitive Function

The Infinitival Complexes

1. Read and memorize the following words and word combinations.

intermediate	посередник
inhibit	стримувати
rate	рівень, швидкість
attempt	спроба
anthrax	карбункул, сибірська виразка
plague	чума
available	доступний, в наявності
establish	встановлювати
brand name	торгова назва
weight	вага
manufacture	виробляти
according to	згідно з
relate	пов’язувати
ring	кільце
attach	приєднувати
application	застосування
interference	втручання
enzyme	фермент
antifungal	протигрибковий
presevative	консервант
acceptable	допустимий
intracelular	міжклітковий
insofar	таким чином

pursue	тут - продовжувати
choice	вибір

2. Find the international words in the text and give their Ukrainian analogues.

3. Read, analyze, define and translate the affixed parts of speech.

intermediate, compound, discover, introduce, inhibit, antibiosis, semi-syntheticantibiotic, aerobic, anaerobic, pennicillin, microbiologist, antibiotics, classify, monolactom, cephalosporins, macrocyclic, tetracycline.

4. Read and analyze the complex words.

widespread, chloramphemcol, tetracyclines, erythromycin, neomycin, cephalosporin, aminoglycoside, aminocyclitol, streptomycins, kanamycin, paromomycin, gentamicin, tobramycin, oleandomycin, spiromycin, amikacin, netilmicin, naphthacenecarboxamide, chlortetracycline, minocycline, demeclocycline, oxytetracycline, aminoglycoside-aminocyclitol, Entero-bacter, dihydrostreptomycindibekacin, biosynthesized, gram-positive, gram-negative, N-acetylglucosamine.

5. Define the topic of the text from the title and the first paragraph.

6. Find all proper names and dates in the text. Tell what you have ever read or head about the first discoverers of antibiotics.

7. Read, translate the text and speak on the history of antibiotics on the basis of the text.

The History of Antibiotics

Antibiotics an-ti-bi-ot'lks, chemical substances produced by microbes (very small cells that usually cause disease) that are capable of killing or inhibiting the growth of another cell. In most cases the cell affected by the

antibiotic is also a microbe. Although antibiotics have achieved paramount importance in the treatment of bacterial infections, some are used in the therapy of fungal infections or cancer. Other drugs that are used to treat these diseases are artificial, for example, the sulfas since they are not of microbial origin they are not, strictly speaking, antibiotics.

The use of molds and other crude materials to treat superficial infections can be traced back to at least 1500 B c through an Egyptian papyrus that provides a comprehensive list of such curative substances. Treatments of this kind were carried out in total ignorance of the disease.

It was not until the late 19th century that the pioneering work of French chemist Louis Pasteur and German physician Robert Koch finally established the germ theory of disease, demonstrating that bacteria or other microbes were responsible for infectious diseases Pasteur also noted that the growth of bacteria responsible for causing anthrax could be prevented by the presence of a contaminating fungus or mold, he suggested that this had therapeutic implications. This inhibition of growth of one organism by another was later termed 'antibiosis' by the French biologist Paul Vulllemin in 1890 The term "antibiotic", as we now understand it, was first coined in 1942 by Selman A Waksman, an American microbiologist.

The story of penicillin's development, the first major antibiotic, started in 1928 with British bacteriologist Alexander Fleming's chance observation that *Staphylococcus aureus* (a common bacterium that can cause a variety of infections) was killed by the presence of a contaminating fungus. The mold producing the substance that killed the bacteria was identified bv Fleming as *Penicillium,* from which the name penicillin derives. This antibiotic proved difficult to isolate, and it was not until 1940, after British scientists Howard W. Florey and Ernst B. Chain had studied the problem, that the potential of penicillin to treat bacterial infections was finally realized. Spurred by World War II large-scale collaboration between the United States and Britain resulted in the widespread use of penicillin in the military.

In 1934 ind 1940 other researchers had begun to work on different antibiotics. In particular Rene Dubos, a French-American microbiologist, superficial infections, and Selman A. Waksman discovered actinomycin, which subsequently proved useful in cancer treatment Waksman's laboratory was also responsible tor the discovery of streptomycin few years later, in 1944. This was the second antibiotic to find widespread usage and became especially important because of its activity against the bacterium that is responsible for tuberculosis.

The next 15 years witnessed a virtual explosion of new discoveries as many pharmaceutical companies recognizing the potential of this approach tor the therapy of infectious diseases, committed enormous resources to search for new antibiotics It was during this period that chloramphemcol the tetracychnes, erythromycin, and other important antibiotics were discovered.

The primary emphasis of this era of discovery was to find new drugs that could be used directly in the treatment of bacterial infections. After 1960 the focus shifted toward chemical modification of known antibiotics as a means of obtaining improved versions. The products of these chemical alterations are referred to as semisynthetic antibiotics, to distinguish them from the original natural products. Chemical modification has given rise to a large number of improved antibiotics. Methicillin represents an early and important example of the success of this approach with the penicillin molecule. More than 20 different semisynthetic penicillins have been marketed.

In the same way that penicillin had served as the starting point tor synthesizing many improved versions so too had another antibiotic called cephalosporin C. In 1945 the Italian scientist Guiseppe Brotsu isolated a fungus identified as *Cephalosporium acremonium.* But it was not until 1953 that British biochemist Edward P. Abraham succeeded in identifying an important new antibiotic produced by the fungus. This antibiotic was cephalosponn C. What was especially interesting about the antibiotic was

that it was stable to penicillnases and had a chemical structure resembling that of natural penicillin.

Notes.

It was not until the late 19th century **that…** – **Тільки** наприкінці 19-го сторіччя…

8. Ask questions of different kinds on the text.

9. Devise the structure of the text in key words. Write down the abstract of the text and retell it.

10. Render te text using the Sequence of Tenses in the Past.

11. Find in the text the following word combinations and translate them into Ukrainian.

inhibiting the growth of another cell, in most cases, affected by the antibiotic, have achieved paramount importance, the use of molds, other crude materials, to treat superficial infections, can be traced back to, provides a comprehensive list, in total ignorance of the disease, the pioneering work, responsible for causing anthrax, contaminating fungus or mold, had therapeutic implications, was later termed 'antibiosis', was first coined, penicillin's development, the first major antibiotic, chance observation, the mold producing the substance, identified bv Fleming as, the potential of penicillin.

12. Find the English equivalents of the following Ukrainian word combinations.

хімічні речовини, здатні лікувати хвороби, спричиняти інфекційні хвороби, грибкові інфекції, штучні ліки, сульфамідні препарати, проводити лікування, це спостереження, мікробна теорія захворювань, відповідати за (спричиняти), лікарські речовини,

накінець встановили, можуть бути випереджені, зробив припущення, стримувати ріст бактерій, виявилося важко відділити, ім'я походить від, було накінець здійснене, широке співробітництво, широке застосування.

13. Fill in the gaps.

responsible, suggested, affected, germ, inhibition, treatment, introduce, prevented , artificial, achieved, growth, develop, inhibit, use.

Antibiotics are capable of ____ the growth or killing other bacteria. Pasteur studied the ____ of different species of microorganisms. Emmerich ____ antibiotics therapeutically. Fleming ____ penicillin. Chain and Florey ____ antibiotic for human use. In most cases the cell ____by the antibiotic is also a microbe. Antibiotics have ____ paramount importance in the ____ of bacterial infections. Other drugs that are used to treat these diseases are ____. It was not until the late 19th century that Louis Pasteur and Robert Koch finally established the ____ theory of disease. They demonstrated that bacteria or other microbes were ____ for infectious diseases. Pasteur also noted that the growth of bacteria responsible for causing anthrax could be ____ by a contaminating fungus or mold. He ____ that this had therapeutic implications.This ____ of growth of one organism by another was later termed 'antibiosis' by the French biologist Paul Vulllemin in 1890.

14. Match the synonyms.

destroy, artificial, suppress, microbe, sickness, make, find, anticeptic, pollute, disease, influence, bacteria, drug, fungus, mold, cure, helpful, intoxicate, drug, treat, infect, contaminate, kill, curative, ailment, discover, aceptic, produce, affect, inhibit, microorganism, synthetic, useful, medicine, illness, ruin, eliminate.

15. Give antonyms of the words.

enhance, clear, realize, responsible, natural, treated, infect, stable,

responsible, observed, identified, suffucient, compose, solved, recognized.

16. Recall all the words with the prefix *-anti* and give word combinations with them.

17. Learn the derivatives and use them in situations.

serve – observe – observing – observed – observation – observer, synthesis - synthetic – synthesize, semi-synthetic – unsynthesized, cure – curable – curative – incurable, treat – treatment – treating – treated, component – compose – composition – compound, use – useful – usefulness – useless – uselessness.

18. Find the words to match the definitions.

very small cells that usually cause disease, a common bacterium that can cause a variety of infections, medicins for conservative treatment of infectious diseases, the drug active against tuberculosis, medical treatment, an important antibiotic produced by the fungus.

19. Define the following notions.

antibiotic, microbe, infection, disease, therapy, fangus, *Actinomyces,* gram-positive, gram-negative, penicillin, semisynthetic.

20. Make up sentences with the expressions in bold type.

1. Actinomycin **proved useful** in cancer treatment. 2. **It was not** until the late 19-th century **that** the gem theory of antibiotics was established.

21. Prepare the text for the back translation.

22. Analyze tense and voice of the verbs in the text. Use them in the sentences in the sentences. Find and translate the infinitives, the infinitival and participial complexes in the text.

23. Use the models of the Infinitive to enter the words below in the

situations on antibiotics production.

Active. Ind. to produce**. Perf.** to have produced**. Cont**. to be Producing**. Perf. Cont.** to have been producing. **Passive. Ind.** to be produced**, Perf.** to have been produced.

precipitate – filtrate, strain – grow, pill – vacuum-press, powder – dry, mixture – prepare, tincture – dose, injection – proscribe, ointment – measure, form – impart, reagent – add, solution – obtain, acid – dilute, alkali / base / acid – react, film / foil – package, produce – consider, link – form, case – investigate, reaction – empede, infection – treat, mixture – make, proscriptios – write, solid substance – dissolve, liquid – evaporate, inflamation – stop, compound – break, formula – read, ingredients – find, compononents – mix.

24. A. Finish the sentences with the infinitive as an adverbial modifier.

1. To prove the idea / fact ____. 2. To illustrate the phnomena ____. 3. To begin with ____. 4. To defend the idea ____. 5. To exemplify the statement ____. 6. To tell the truth ____. 7. To continue ____. 8. To finish / conclude ____. 9. To make the long story short ____. 10. To support the statement ____. 11. To supply the examples ____. 12. To add ____. 13. Not to mention ____. 14. To take into consideration ____. 15. To supply the proofs ____.16. Not to depend on ____ . 17. To ground the theory ____.

B. Use the infinitive 1) as an object.

1. I find (believe) it necessary ____. 2. It is for us to ____. 3. Allow me ____. 4. We want them to ____. 5. It is important to ____. 6 Tell her ____ . 7. Someone advised him ____ . 8. I asked them ____.

2) as an attribute.

1. There are problems ____. 2. It is a fact ____. 3. I have the report ____. 4. One has his body ____ . 5. The pills, powders, ointments, injections ____. 6. I have three more books ____.

25. Transform the nouns, gerunds and participles in the text below into the infinitives wherever possible.

Antibiotics are capable of killing or inhibiting the growth of another cell. The pioneering work of French chemist Louis Pasteur and German physician Robert Koch finally established the germ theory of disease, demonstrating that bacteria or other microbes were responsible for infectious diseases. Rene Dubos, a French-American microbiologist, discovered tyrothricin, which had some utility in the topical treatment of superficial infections. Selman A. Waksman discovered actinomycin, which subsequently proved useful in cancer treatment. Waksman's laboratory was also known tor the discovery of streptomycin in 1944. Antibiotics have achieved paramount importance in the treatment of bacterial infections. Penicillin had served as the starting point tor synthesizing many improved version. It was not until 1953 that British biochemist Edward P. Abraham succeeded in identifying cephalosponn C. After 1960 the focus shifted toward chemical modification of known antibiotics as a means of obtaining improved versions.

26. Discuss the situations using the Infinitive as well as the argumentation and connective words.

1. Pioneers in antibiotics research. 2. The history of antibiotics development. 3. Antibiotics sources.

to / for the purpose, to no purpose / to no end

the thing is / the matter is / the reason is, the case to consider, in this case, to prove the case

proved / turned difficult to isolate / proved (un)useful

it was not until / it was just this discovery / medicine / that

refered to as / termed / called

to distinguish / differ / differenciate / tell them from

here is no evidence that, it is unlikely that, it is likely that, in all likelyhood, it goes without saying that, it’s evident that, it leaves no doubt

about.

27. Translate the following text into English.

Антибіотики (від анти- – проти- і грецького bioticos – життєвий) – речовини мікробного, рослинного і тваринного походження, що вибірково вбивають мікроорганізми або пригнічують їхню життєдіяльність. Ще у XIX ст. було відомо, що між різними мікроорганізмами можуть існувати як симбіотичні (взаємовигідні), так і антагоністичні відносини. Антагонізм – взаємодія двох організмів, за якої один пригнічує життєдіяльність іншого.

Франц. вченого Л. Пастера та німецького - Роберта Коха вважають основоположниками мікробіології як науки. Л. Пастер з 1856 року вивчав процеси бродіння. Він встановив, що скисання та згіркнення вина та пива спричиняються окремими видами мікроорганізмів, які розвиваються у процесі бродіння чи в готових продуктах. Він запропонував методи попередження цих захворювань (прогрівання готового продукту). Пізніше Л. Пастер відкрив стрептокок, збудників остеомієліту, гнійних абсцесів, курячої холери і зробив висновок про те, що кожна інфекційна хвороба спричиняється специфічним мікроорганізмом. Л. Пастер також розробив метоли запобіжних *щеплень* тощо. Встановивши існування мікроорганізмів, які можуть жити у безкисневих умовах, Л.Пастер вперше ввів термін аеробний та анаеробний.

Роберт Кох (1843-1910) довів, що захворювання може спричинятись як вегетативними клітинами, так і спорами. У1882 р. Р. Кох відкрив збудника туберкульозу – паличку Коха. З культури туберкульозної палички, яка була вирощена на рідкому поживному середовищі, він одержав препарат *туберкулін.* В експедиції до Єгипту та Індії для боротьби з холерою він відкрив холерний вібріон.

Поштовхом до з'ясування матеріальної основи антибіозу було спостереження А. Флемінга, який у 1928 р. виявив, що колонія гриба *РепісіШит поіаіит* пригнічувала ріст стафілококів. З тих пір було виявлено багато речовин з антибіотичною активністю.

Part II

28. Read and sum up the text.

Antibiotics Classification

Chemically, the antibiotics are low molecular weight compounds of various chemical structures, composition, and properties. They have been classified according to the chemical structure, microbial source, and mechanism of action. Following the classification of Garrod, Lambert, and O'Grady, based on the general similarity of chemical structure, those manufactured today can be divided into the following groups:

Penicillin and related antibiotics with a β-lactam ring in their structure, include the natural penicillins, the semisynthetic penicillins, the cephalosporins, the clavulanic acids and thienamycins and the monolactoms.

Aminoglycoside antibiotics, which have amino sugars in glycosidic linkage, include the streptomycins, neomycin, kanamycin, paromomycin, gentamicin, tobramycin, and amikacin.

Macrolide antibiotics, which consist of a macrocyclic lactone ring to which sugars are attached, comprise erythromycin, oleandomycin, and spiromycin.

Tetracycline antibiotics, which are derivatives of polycyclic naph-thacenecarboxamide, include tetracycline, chlortetracycline, demeclo-cycline, oxytetracycline, and minocycline.

Antibiotics that kill bacteria are called bactericidal, while those that only inhibit their growth are referred to as bacteriostatic. In many cases it is sufficient to use a bacteriostatic antibiotic to treat an infection, because the number of bacteria are kept at a low enough level for the patient's immune system to clear the infection.

Peptide antibiotics form a large group but have few therapeutic applications. These antibiotics are composed of peptide-linked amino acids

which commonly include both D- and L-forms. This group includes bacitracin, gramicidin, and the polymyxins.

Antifungal antibiotics include polyenes, which are a group of over 50 compounds including nystatin and amphotericin B, and other antifungal antibiotics including 5-fluorocytosine, clotrimazole, and griseofulvin.

Nisin, formed by *Streptococci* is used as a preservative in food production. It is a short polypeptide containing seven amino acids, and it is now recognized as an antibiotic that is particularly active against clostridia and lactosecond, interfering with genetic mechanisms; and the third, interfering with intracellular enzymic activity. It is a natural component of some cheeses and is therefore an obvious choice as preservative for other cheeses. It is now used also in canned foods that are prone to clostridial spoilage.

Antibiotics are identified by: (1) the conventional chemical name or a name of the compound chemical structure; (2) a shorter, established name; and (3) the trade or brand name given to the drug by the manufacturer.

For the most part, these antibiotics are white, off-white, tan, or yellow solids that are usually amorphous but sometimes crystalline. They decompose upon heating to elevated temperatures. Most have a free carboxyl group; as their salts, they are soluble in polar solvents, especially water or in organic solvents as their free acids. There are bacteriostatic and bacteriocidal antibiotics to treat infections.

29. Ask questions of different kinds on the text.

30. Make up an abstract of the text with key words, introductory and connective words and learn it by heart.

31. Find in the text the following word combinations and translate them into Ukrainian.

of, the general similarity of, related antibiotics, in glycosidic linkage,

macrocyclic lactone ring, sugars are attached, comprise erythromycin, derivatives of, are called bactericidal, are referred to as, prone to spoilage, contain an aminocyclitol unit, chemical reduction of, clinically useful compound, naturally occurring, relatively small, form stable acid addition salts, alimentary trace, proscribed for systemic use, growing under anaerobic conditions, constitutes an important use, rather than bacteriostatic, involving stages, binding to, encounter some problems, bacterial resistance, prone to spoilage.

32. Find the English equivalents of the following Ukrainian word combinations.

з точки зору хімії, низькомолекулярна сполука, різні властивості, механізм дії, заснований на схожесті, поділяти на групи, складатися з, приєднані до, похідні сполуки, підсилювати ріст, тримати на низькому рівні, лікувати інфекцію, виявити інфекцію, протигрибкові антибіотики, втручання у діяльність, внутрішньоклітинниі ферменти, обов'язкова складова, звична (прийнята, торгова) назва ліків, консервована їжа, так само, як і; за вийнятком, нові надходження, отримується біосинтезом з, широкого спектру дії, призначати всередину, ферментаційне середовище, водорозчинні молекули, широкого вжитку.

33. Fill in the gaps.

acid, contain, derivative, intramolecular, compose, acid, produce, preservative, canning, compound, ring, antifungal, property, linkage, weight.

All but a few antibiotics are made by aerobic ____ processes. Nisin is also used in ____ fruits. Chemically, antibiotics have low molecular ____. Antibiotics are compounds of various ____. Peptid antibiotics are ____ of peptid linked amino acids. ____ antibiotics include polyenes, which are a group of over 50 ____ including nystatin and amphotericin B, and other antifungal antibiotics including 5-fluorocytosine, clotrimazole, and griseofulvin. Nisin is a ____. It is a short polypeptide ____ seven amino acids,

interference with genetic mechanisms, and interference with ____ enzymic activity. It is a natural component of some cheeses It is now used also in ____ food. Macrolide antibiotics consist of macrocyclic lacton ____ . Polyenes are a group of over 50 ____. Cycloserine is ____ entirely by chemical synthesis. Chloramphenicol is a nitrobenzene derivative of dichloracetic ____.

34. Find in the text the synonyms to the following words.

structure, select, connect, composed, join, bond, include, suppress, enough, cure, rate, clean, contain.

35. Match the medicines with their forms as they are available in the drug-store. Model. Penicillin is available in pills / as pills.

1) propolis, sulfadimezin, ampicyllin, manganese, streptocid, parazetamol, Vietnamese balm, spirit, herbs, tetracyclin, streptomycins, nitrofungin, vitamins, boric acid, seeds, leaves, roots, flowers, stems, ichthyol, calanhoe, ammoniac, beladonna, convalia, valeriana, atropin, besalol, Denta, aloe.

2) mixture, tincture, pills, powder, ointment, suspension, injection, crystals, solution, dried packaged, juice, drops.

36. Make up situations: 1. At the doctor. 2. At the chemist's.

Model 1. The drug is reported to be ____

abortifacient, balsamic, cardiotonic, carminative (вітрогінне), digestive, diuretic, expectorant, lactagogue, restorative, stimulant, stomachic, tonic**,** vermicide, and anticancerogenic, purgative, laxative, cardiac, pain-killer, sorbent, antidepressant, narcotic, aphrodisiac (збуджуюче), diaphoretic (потогінне), emmenagogue (очищуюче), pectoral (грудне), restorative, immunogenic.

Model 2. The remedy is administered for / against, is said to help against /in case of / is used for / against / is prescribed for / against.

pain, cough, sore throat, headache, stomachache, tonsilitis, toothache, diarrhea, poisoning, cold, influenza (gripp), fever, sore eyes, hemorrage, amenorrhea, backache, cholera, colic, dyspepsia, enteritis, enuresis, gastritis, gonorrhea, nausea, constipation, nephrosis, snakebite, spasm (cramp), anaemia, anorexia (відсутність апетиту), insomnia (безсоння), leukaemia, chicken pox (вітряна віспа), mumps (свинка), scarlet fever (скарлатина), diftheria, pneumonia, tuberculosis, carcinomata, cancerous wounds, obesity (надлишкова вага), indigestion, indurations (набряк) of the liver and spleen, tumor, injury, condylomata, haimoritis, sinuit, hyperthyreosis.

37. Prepare the text for the back translation.

38. Discuss the situations using the Infinitive as well as the argumentation and connective words.

1. Chemical classification of antibiotics. 2. Bacteriosidal and bacteriostatic antibiotics. 3. Antibiotics properties and use. 4. Innovations in antibiotics. 5. Arguments for and against antibiotics.

39. Translate the following text.

Антибіотики – це речовини біологічного походження, здатні навіть у низьких концентраціях пригнічувати ріст мікроорганізмів. Шість родів мікроміцетів продукують майже 1000 антибіотиків. До них належать *Cephalosporium* – продуценти цефалоспоринів і *Penicillium* – продуценти пеніцилінів. Нині відомо понад 2000 антибіотиків, але тільки близько 50 з них використовуються як хіміотерапевтичні засоби. Розрізняють речовини, що пригнічують ріст мікроорганізмів (бактеріостатичні, фунгістатичні), і такі, що їх вбивають (бактерицидні, фунгіцидні). Продуцентами антибіотиків є гриби з групи аспергілів, актиноміцети (стрептоміцети), а також деякі бактерії (бацили).

Пеніциліни. Продуценти – *Penicillium notatum, Penicillium chrysogenum.* Пеніциліни – це перші антибіотики, які були використані з

лікувальною метою (1941 р.). До пеніциліну чутливі переважно грампозитивні бактерії родів *Streptococcus, Stafylococcus, Bacillus subtilis.* Нотатин відомий за назвами пеніцилін А, пеніцилін В, пеніцидин; у присутності кисню окиснює глюкозу з утворенням перекису водню, чим і пояснюються його антимікробні властивості.

Гризеофульвін має фунгіцидну дію. Продуцент – *Penicillium griseofulvum.*

Цефалоспорини – продукти одного з видів гриба *Cephalosporium.* Цефалоспорин С має р-лактамове кільце і за своєю структурою схожий з цефалоридин), які за своєю дією схожі на похідні пеніциліну.

Стрептоміцин синтезують види *Streptomyces. Д*іє на ряд кислотостійких і грамнегативних бактерій, нечутливих до пеніциліну, але викликає алергічні реакції. Цей антибіотик застосовується також у вете ринарії і для боротьби з захворюваннями рослин.

Хлороміцетин (хлорамфенікол, левоміцетин) виявлений у культурах *Streptomyces venezuelae,* але його можна одержати і синтетичним шляхом. Діє на більшість грамнегативних бактерій, у тому числі на спірохети, рикетсії, а також на актиноміцети і великі віруси.

Тетрацикліни являють собою метаболіти стрептоміцетів *(Streptomyces aureofaciens).* Хімічно тетрацикліни (хлор-тетрациклін, окситетрациклін і тетрациклін) близькі між собою і мають в основі структури нафтацен. Відзначаються широким спектром дії.

Поліпептидні антибіотики (граміцидин 8, поліміксини, бацитрацин та ін.) характеризуються високим спорідненням до плазматичної мембрани, тому є однаково токсичними як для про-, так і еукаріот. У клінічній практиці не застосовуються.

LESSON 9

The Infinitival Complexes

Part I

1. Read and memorize the following words and word combinations

comprise	включати
common feature	спільна риса
retention	утримання
recently discovered	нещодавно відкритий
adjacent	що межує
directly linked	беспосередньо пов’язаний
regard	вважати
opposite	напроти
designate	визначати
ester	ефір
show	показувати
substitute	замінник
fused ring	конденсоване ядро

2. Find the international words in the text and give their Ukrainian analogues.

3. Read, analyze, define and translate the affixed parts of speech.

treatment, corresponding, respectively, variety, aromatic derivatives, reaction, produce, phenazine, phenoxazine, undergo, conjugate, addition, reaction monobactam, tetrahedral, opposite, semisynthesis, nonclassical, nocardicin, irreversible, intensity, concentration, dihydrothiazine, oxacephalosporins, substituent.

4. Read and analyze the complex words.

o-phenylenediamine, pyrroline, o-aminophenol, cephamycin, aminoguanidine, quinonimine, cephalosporin, oxacephalosporin, nocardicins, carbapenem, thienamycin, monobactam, nitrogen, dihydrothiazin, dihydrooxazine, oxazolidine, six-membered, thiazoline.

5. Look through the text for information. Read and translate the text.

Production of *β*-Lactam Antibiotics

The β-lactam antibiotics comprise two principal groups of therapeutic agents, i. e., the penicillins and the cephalosporins (including the cephamycins and oxacephalosporins), and several nonclassical types obtained more recently by fermentation and (semi)synthesis. The latter include the nocardicins, carbapenems (thienamycins and olivanic acids), penems, monobactams, and clavulanic acids. These antibiotics have in their chemical structures a four-membered lactam.

With the exception of the nocardicins and monobactams, the β-lactam is fused through the nitrogen and the adjacent tetrahedral carbon atom to a second ring, i. e., a five-membered thiazolidine, pyrroline, thiazoline, or oxazolidine for the penicillins, carbapenems, penems, and clavulanic acid, respectively, or a six-membered dihydrothiazine or dihydrooxazine for the cephalosporins, cephamycins, and oxacephalosporins. These antibiotics carry a variety of substituents which contribute to their biological properties.

A structural feature common to most members of this group is the carboxyl group on the carbon adjacent to the lactam nitrogen, although this group has been chemically converted to a tetrazole with retention of biological activity, and the monobactams have a directly linked sulfonic acid group. The penicillins, cephalosporics,

nocardicins, and monobactams also possess a functionalized amino group on the carbon atom opposite the nitrogen of the β-lactam. The recently discovered carbapenems and clavulanic acids are not functionalized in this way.

The β-lactam antibiotics inhibit bacteria, exhibiting activities that differ in pattern and intensity by interfering with the synthesis of essential structural components of the bacterial cell wall. They tend to be irreversible inhibitors of cell-wall synthesis, and are bactericidal at concentrations close to their bacteriostatic levels. They are regarded as highly effective antibiotics with low toxicity, used for treating a wide variety of bacterial infections. Some of the β-lactams are inhibitors of the β-lactamases, which have become important factors in the therapeutic use of these antibiotics.

The parent structure of all penicillins is *β-aminopenicillanic acid* (6-APA), which consists of a thiazolidine ring with a condensed β-lactam ring. The 6-APA carries a variable side chain in position 6. If the penicillin fermentation is carried out without addition of side-chain precursors, the natural penicillins are produced. By adding to the broth a *side-chain precursor* a desired biosynthetic penicillin is produced.

To produce the most useful penicillins, those with activity against *gram-negative Bacteria,* such as *ampicillin,* a combined fermentation and chemical approach is used that leads to the production of semisynthetic penicillins. In this case, a microbially produced natural penicillin is split either chemically or enzymatically to yield 6-APA; the latter is then chemically modified by the addition of a side chain. Penicillin G is produced by the mold *Penicillium chrysogenum* in fermentors. Being a highly aerobic process it requires efficient aeration. Penicillin is a typical secondary metabolite. During the growth phase, very little penicillin is produced, but once the carbon source has been nearly exhausted, the penicillin production phase begins. By supplying additional carbon and nitrogen, the production phase can be extended for several days.

A major ingredient of most penicillin production media is *corn steep liquor,* which contains nitrogen as well as several growth factors. The carbon source is generally *lactose*, obtained from whey. Lactose is the initial carbon source. As the lactose becomes limiting, "feedings" with glucose later in the fermentation maximize penicillin yield. Penicillin is excreted into the medium, the cells are removed by filtration, the pH of the medium is lowered and the antibiotic extracted with an organic solvent. After concentration into the solvent, the antibiotic is back-extracted into an alkaline aqueous medium, concentrated further, and crystallized.

6. Ask all kinds of questions on the text.

7. Write the plan of the text.

8. Make up an abstract of the text with key-words and retell it.

9. Find in the text the following word combinations and translate them into Ukrainian.

comprise, principal groups, therapeutic agents, ie, obtained by fermentation, the latter include, a four-membered lactam, with the exception of, is fused through…to, adjacent to, a variety of substituents, contribute to, their biological properties, chemically converted to, with retention of, also possess, functionalized amino group, opposite the nitrogen, the recently discovered, they tend to be, irreversible inhibitors, close to their bacteriostatic levels, they are regarded as, with low toxicity.

10. Find the English equivalents of the following Ukrainian word combinations.

складатися з, отримувати синтезом, спільна риса, за вийнятком, безпосередньо приєднуватися, привноситити властивості, конденсуватися через, додавати карбон, проти азоту, таким

чином, пригнічувати бактерії, виявляти активність, застосовуються для лікування, втручаючися у, хімічно перетворений на, вводится через, широке різноманіття, розщеплюватися ферментом, концентраця в розчині, лужний водний розчин, видалятися фільтрацією.

11. Fill in the gaps.

precursor, chain, yield, supply, obtain, media, growth, exhaust, ring, mold.

β-aminopenicillanic acid (6-APA) consists of a thiazolidine ring with a condensed β-lactam ____ . By adding to the broth a *side-chain* ____ one desired biosynthetic penicillin is produced. 6-APA is chemically modified by the addition of a side ____ . Penicillin G is produced by the ____ *Penicillium chrysogenum* in fermentors. During the ____ phase, very little penicillin is produced. Once the carbon source has been nearly ____, the penicillin production phase begins. By ____ additional carbon and nitrogen, the production phase can be extended for several days. A major ingredient of most penicillin production ____ is *corn steep liquor*. The carbon source is generally *lactose*, ____ from whey. As the lactose becomes limiting, "feedings" with glucose later in the fermentation maximize penicillin ____.

12. Give synonyms of the following words.

nearby, bear, link, ruin, application, add, receive, alike, characteristic, separate, property, tie up, use, join, divide, similar, carry, adjacent, use, destroy, drug, member, media, activity, treat, elemen, component, pill, mixture, ointment, powder, injection, work, motion, process, cure.

13. Give antonyms of the words.

positive, create, substract, yield, distinguishing, join, poison, resistable, like, curable, reversible, use, bacterial, fungal, infectious, regular, active, infect, responsible, effective.

14. Learn the derivatives and use them in situations.

soluble – solvent – dissolve – solubility – unsoluble – solution, antibiotic – probiotic, fuse – fusible – fusibility – fusion – diffusion.

15. Find the words to match the definitions.

the parent structure of all penicillins, penicyllin – the product of fermentation and chemical approach, not natural, the initial carbon source, the stage in penicillin production after its concentration into the solvent.

16. Give the definitions of the following words.

drug, fermentation fuse, (semi)synthesis composition, inhibit, enhance, orally, synthesize, destroy, treat, acid, enzyme, substituent.

17. Consider polysemy of the noun *treatment* in the text.

18. Prepare the text for the back translation.

19. Analyze tense and voice of the verbs in the text. Use them in the sentences or situations. Define the functions of the infinitives.

20. I. Finish the sentences with the Infinitive.

Model 1. I'm (terribly) sorry to have said that.

1. I really am sorry ____. 2. I should confess / admit ____ . 3. It wasn't my fault not ____. 4.I couldn't ____. 5. What else can ____ ? 6. I didn't realize ____ .

Model 2. He's too young to have done it.

tired / unexperienced / busy / clever / efficient / intelligent / reliable / kind / competitive / organised enough / rather learned ____ .

Model 3. pronoun / adverb + Infinitive. There is nothing to do.

1. There's something ____. 2. Is there someone ____ ? 3. There's a lot ____ . 4. There was little ____ . 5. There will be few calculations ____ .

II. Make up sentences after a model.

Model 1. seem + Infinitive. The process seems to go right.

1) cell – split, bacteria – divide, fangus – grow, mold – multiply, virus – replicate, enzyme – proved efficient, medicine – cure, discovery – provide.

Model 2. Infinitive + modal verb or its equivalent.

1) Expect / remind / would like / hope remember / forget / force / make / allow / be able / have to do something / to have / get something done / make / let / one can / may / must (someone) do something,

2) It needs / will have to be done.

3) 1. I would rather go there. 2. I'd rather (she, he, she you, they, we) went there, didn 't go there. 3. I used to do it.

21. Discuss the situations using the Infinitive as well as the argumentation and connective words.

1. The name β-lactam antibiotics. 2. β-lactams chemical composition. 3. β-lactams application. 4. Penicillins sources and application.

be critical about, put to criticism / doubt

It's an error. The theory is erroneous.

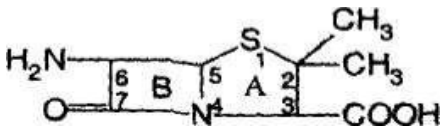
make a mistake, fall into gross mistake. I may be mistaken.The fault is mine.

the merit / demerit /drawback / flaw / defect of the teaching

give convincing arguments, examples drawn from nature, support the theory with experiments / practice, support the word with deed / statement with facts, dispose of the facts, be inclined to, be of the same opinion, share the oponent's opinion

22. Translate the extract into English.

Пеніциліни виробляються різновидом плісняви: *Penicillinum notatum, Penicllinum Chrysogenum etc.; Цефалоспорин – пліснявою Cephalosporinum etc.* (евкаріоти) роду *Penicillium* and *Aspergillus* та певними прокаріотами. В основі молекули пеніцилінів лежить 6-амінопеніциланова кислота (6-АПК), яка складається з конденсованих тіазолідинового (А) і β-лактамного (В) циклів:

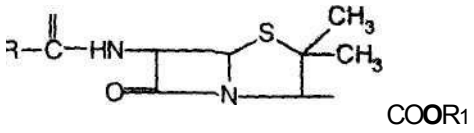


6-АПК

Для проявлення біологічної активності велике значення має β--лактамний цикл, який дуже нестійкий у кислому і лужному середовищах.

Напівсинтетичні пеніциліни – це ацильні похідні 6-АПК. Ацилюючими агентами є хлорангідриди відповідних карбонових кислот.

У медичній практиці використовують такі лікарські засоби пеніцилінів загальної формули:



Клінічно корисні пеніциліни включають багато продуктів біокаталітичних реакцій та хімічної модифікації органічниними хімічними речовинами. Пеніцилінам G та V надають перевагу для лікування багатьох грам-позитивних інфекцій.

Зараз в усьому світі пеніциліни, як і інші антибіотики, отримують методом глибинного культивування. У промисловості спори розмножують, вирощуючи міцелій в скляних флаконах на просяному середовищі. Отриманий споровий матеріал використовують для засіву інокуляторів. У посівних ферментаторах міцелій вирощують 12-18 год. Живильне середовище для вирощування міцелію і біосинтезу пеніциліну готують з кукурудзяного екстракту, лактози, глюкози, мінеральних речовин і деяких препаратів фенілоцтової кислоти – попередників антибіотика. Після відділення міцелію у фільтраті міститься 3-6% сухих речовин, з яких 1,5-3,0 % складає пеніцилін. Після екстрагування і очищення вихід пеніциліну складає 85 % від його кількості в культуральному середовищі.

Part II

23. Memorize the following definitions.

Enrichment culture a means of obtaining laboratory cultures of microorganisms from a natural sample by using highly selective methods.

Screening any procedures that permit the identification of organisms by phenotype or genotype, but do not inhibit or enhance their growth.

Selection placing organisms under conditions where the growth of those with a particular genotype will be favored.

24. Read and sum up the text.

Search For New Antibiotics

Although pharmaceutical companies currently do much of their drug discovery using computer modeling, traditionally, antibiotics were discovered by *screening.* In this approach, a large number of isolates of possible antibiotic-producing microorganisms are obtained from nature in pure culture, and these isolates are then tested for antibiotic production by seeing whether they produce any diffusible materials that are inhibitory to the growth of test bacteria. The test bacteria used are selected from a variety of bacterial types but are chosen to be representative of, or related to, bacterial pathogens

The classical procedure for testing new microbial isolates for antibiotic production is the *cross-streak* method. Those isolates that show evidence of antibiotic production are then studied further to determine if the antibiotics they produce are new. Once an organism producing a new antibiotic is discovered, the antibiotic is produced in sufficient amounts for structural analyses and then tested for toxicity and therapeutic activity in infected animals. An antibiotic that is to be produced commercially must be produced successfully in large-scale industrial fermentors. The next stage is *to purify* the product efficiently. If the antibiotic is soluble in an organic

solvent, it may be relatively simple to purify it by extraction into all volume of the solvent. If the antibiotic is not solvent soluble, then it must be extracted by adsorption, ion exchange, or chemical precipitation. In all cases, the goal is to eventually obtain a crystalline product of high purity.

One of the major tasks of the industrial microbiologist is thus to *isolate high-yielding strains.* Strain selection involves mutagenesis of the initial culture, plating of mutant types, and testing of these mutants for antibiotic production.

Genetic engineering has greatly improved the time-consuming process of obtaining high-yielding strains. For example, *gene amplification* makes it possible to insert additional copies of genes of interest into a cell by means of a vector such as a plasmid. It is often unclear which genes should be altered or increased in number to increase yields. Thus, it is important first to identify the *rate-limiting* or other key regulatory steps in a given biochemical pathway through basic research.

25. Ask all kinds of questions on the text.

26. Make up the abstract of the text and retell it.

27. Find in the text the following word combinations and translate them into Ukrainian.

discovered by screening, a large number of isolates, tested for antibiotic production, a variety of, chosen to be representative of, produced successfully, large-scale industrial fermentor, relatively simple to purify, all volume of the solvent, in all cases, the goal is, a crystalline product, one of the major tasks, to isolate high-yielding strains, strain selection involves.

28. Find the English equivalents of the following Ukrainian word combinations.

робити відкриття, при цьому підході, чиста культура, стримує ріст, метод пересічного штриха, свідчити про, визначати чи, достатня кількість,

наступна стадія, розчинний у органічних розчинниках, добувається абсорбцією, йонним обміном, хімічним осадженням, отримати продукт, високопродуктивні штами, вихідна культура, посів на чашку (dish) Петрі.

29. Fill in the gaps.

obtain, solvent, selected, determine, strain, cross-streak, screening, purify, diffusible, discovery.

Traditionally, antibiotics were discovered by ____ . Pharmaceutical companies currently do much of their drug ____ A large number of isolates of possible antibiotic-producing microorganisms are ____ from nature in pure culture. These isolates are then tested whether they produce any ____ materials that are inhibitory to the growth of test bacteria. The test bacteria used are ____ from a variety of bacterial types. The classical procedure for testing new microbial isolates for antibiotic production is the ____ method. Those isolates that show evidence of antibiotic production are then studied further to ____ if the antibiotics they produce are new. The next stage is to ____ the product efficiently. If the antibiotic is soluble in an organic ____, it may be relatively simple to purify it by extraction into all volume of the solvent. One of the major tasks of the industrial microbiologist is thus to isolate *high-yielding* ____ .

30. Match the synonyms.

comprise, apply, separate, kind, transform, ferment, quantity, produce, receive, process, isolate, species, use, enzyme, amount, manufacture, obtain, include, treat, convert.

31. Prepare the text for the back translation.

32. Discuss the situations using the Infinitive as well as the argumentation and connective words.

1. Methods of searching for new antibiotics. 4. Procedure of testing new microbial isolates for antibiotic production. 5. Industrial microbiology.

33. Translate the following abstract into English.

У наш час набули поширення поняття *пробіотики, пребіотики, пребіотичні продукти, еубіотики.*

Термін "пробіотики" в буквальному перекладі означає "для життя". Пробіотики (синонім поняття еубіотики) — це живі мікроорганізми, які у складі харчових продуктів людини стимулюють ріст і біологічну активність мікроорганізмів у кишечнику. Еубіотики поділяють на дві великі групи: еубіотики на основі чистих культур мікроорганізмів — пробіотики, симбіотики (від слова "симбіоз") або мультибіотики еубіотики змішаного складу (з додаванням амінокислот, мікроелементів, моно- та дисахаридів і т.ін.). До пробіотиків-еубіотиків відносять представників нормальної мікрофлори кишечника — біфідобактерії та лактобацили. Більшість пробіотиків, які є в наш час на фармацевтичному ринку, використовуються для лікування та профілактики дисбактеріозів шлунково-кишкового тракту. Основні з них такі:

біфідумбактерин сухий — містить ліофільно висушені живі клітини штамів *Bifidobacterium bifidum* № 1 і 791. В одній дозі препарату не менше 10^8 живих клітин. Випускається в таблетках, капсулах, пакетах, флаконах; біфідумбактерин форте містить клітини біфідобактерій, іммобілізованих на сорбенті (активне вугілля); біфілонг містить види *Bifidobacterium bifidum* і *Bifidobacterium longum;* біфікол сухий — *Bifidobacterium bifidum* N° 1 та *Escherichia coli* № М-17; виробляються також: лінекс, лактобактерин сухий, колібактерин сухий, біоспорин. З використанням рекомбінантного штаму *Bacillus subtilis* 2335/105 був створений пробіотик нового покоління — субалін, який характеризується високою антибактеріальною та антивірусною активністю. Пробіотики на основі бацил розроблені в Інституті мікробіології і вірусології НАН України.

LESSON 10

The Gerund Functions

Part I

1. Read and memorize the following words and word combinations.

substituent	замінник
intramolecular	внутрішньомолекулярний
adjacent	суміжний, який прилягає
cause	спричиняти
profusion	надлишок
red blood cells	червоні кровяні тільця
disorder	порушення
intestines	кишки
cardiac disturbance	серцеве порушення
germinating seeds	пророщені зерна
growing shoots	паростки
mucocutaneous	слизьоподібне
junctions	з'єднання
congestion, desquamation	лупіння
conjunctiva	слизьова оболонка ока
extensive use	широке вживання
essential amino acids	незамінні амінокислоти
in short supply	в недостатній кількості
flavour enhancer	підсилювач смаку
sweetener	підсолоджувач
level	рівень
feedback inhibition	обмеження зворотнього зв'язку
commercially viable	комерційно вигідний
site	ділянка, центр

2. Find the international words in the text and give their Ukrainian analogues.

3. Read, analyze, define and translate the affixed parts of speech.

convert, coenzyme, concern, ingest, inbred, heterogenous, insufficient, accumulation, metabolic, degeneration, desquamation, appearance, essential, quantity, activate, relationship, activity, distinguish, supplement, supply, progressively, defficiency, particularly, provide, derivative, substance, transamination, incorporation, intake.

4. Read and analyze the complex words.

carbohydrate, riboflavin, pyridoxine, malfunctioning, biosynthethis, furthermore, insofar, wholemeal, groundnut, cottonseed, nevertheless.

5. Study the text to prove the importance of vitamins. Read and translate the text.

Vitamins

Vitamins and amino acids are growth factors that are used pharmaceutically or are added to foods. Most vitamins are made commercially by chemical synthesis. Seven important vitamins and amino acids are produced by biocatalytic processess: vitamin B_{12} and riboflavin are the most important of of vitamins.

Vitamin B_{12} is synthesized in nature lively by microorganisms, e. g. intestinal bacteria. As a coenzyme, vitamin plays an important role in animal biochemistry in usual intramolecular rearrangements in which a hydrogen atom on one carbon atom and a substituent on agacent carbon atom exchange places. In humans, a deficiency of vitamin B_{12} leads to a severe jondice called *pernicious anemia,* characterized by the profusion of red blood cells and nervous system disorders. In industrial production of vitamin

B_{12}, microbial strains are employed that have been specifically selected for the high yields of the vitamin. Members of the bacteria genera *Propionibacterium* and *Pseudomonas* are the commercial producers. Cobalt is a metal found in vitamin B_{12} and yields of the vitamin are increased by addition of small amounts of cobalt to its culture medium.

Riboflavin (vitamin B_2) is the parent compound of flavins, FAD and FMN, coenzymes that play important roles in enzymes involved in oxidation-reduction reactions in virtually all organisms. Riboflavin is one member of a large family of flavins which, characteristically, have a heterocyclic nitrogen-containing ring system coupled to a sugar group. The vitamin must be converted to a nucleotide before it becomes active. It then acts as a coenzyme, that is, in concert with an enzyme, for systems that are concerned with either, oxygen, hydrogen, or electron transport. The vitamin is produced in the plant world by germinating seeds and growing shoots, and in man by intestinal bacteria.

Riboflavin is synthesized by many microorganisms, including bacteria, yeasts, and fungi. The fungus *Ashbya gossypii* nurally produces huge amounts of this vitamin and is therefore used for most of the microbial production processes. Despite this good yield, there is an economic competition between the microbiological and strictly chemical synthesis. Whether ingested or inbred, it is transported from the gut to the mitochondria — known as the power houses — of biological cells to take part in the production of energy. Deficiency symptoms are inflammation of the tongue, lesions at mucocutaneous junctions of the eyes and lips, congestion of conjunctival blood vessels, and desquamation of the skin. It is a bright yellow pigment, and for this reason it, and a phosphate derivative of it, are permitted food colours.

Vitamins K (quinon), D (sterol), biotin and folic acid are other vitamins produced by intestinal bacteria.

6. Say whether the following statements are true or false and

give your proofs why.

1. Most vitamins are of natural origin. 2. Vitamin B_{12} is synthesized in nature lively by fungi. 3. As an enzyme, vitamin plays an important role in animal biochemistry in usual intramolecular rearrangements in which a hydrogen atom on one carbon atom and a substituent on agacent carbon atom exchange places. 4. In humans, a deficiency of vitamin B_{12} leads to diarrhea. 5. Vitamin B_2 is produced in the plants and by intestinal microorganisms. 6. There is an economic competition between the microbiological and strictly chemical synthesis. 7. Whether ingested or inbred, vitamin B_2 is transported from the gut to the mitochondria of biological cells to take part in the reproduction.

7. Ask questions of different kinds on the text.

8. Write a plan of the text in key words.

9. Prepare an abstract of the text using the introductory and connective words and learn it by heart.

10. Find in the text the following word combinations and translate them into Ukrainian.

growth factor, added to foods, intramolecular rearrangements, substituent on agacent carbon atom, deficiency leads to, requirements for the vitamin are satisfied, by intake or by absorption, produced by intestinal microorganism, microbial strains are employed, for the high yields of the vitamin, members of the bacteria genera, small amounts, culture medium, parent compound of flavins, involved in oxidation-reduction reactions, have a ring system, coupled to a sugar group, must be converted to a nucleotide, acts as a coenzyme, in concert with.

11. Find in the text the English equivalents of the following Ukrainian word combinations.

фактор росту, додаватися до їжі, використовуватися у фарма-

кології, виготовлятися для торгівлі, вироблятися в кишках тварини, найбільш важливий, грати головну роль, замінник на атомі, дефіцит вітаміну, призводити до, застосовуються штами культур, спеціально відібрані, велике виробництво, який знаходиться, збільшувати додаванням, невелика кількість, середовище культури, сполука – джерело, брати участь у ферментації.

12. Fill in the gaps.

growth, amounts, yields, added, coenzyme, increased, employed, rearrangements, substituent, deficiency.

Vitamins and amino acids are____ factors that are used pharmaceutically or are ____ to foods. As a ____ vitamin plays an important role in animal biochemistry in usual intramolecular ____ in which a hydrogen atom on one carbon atom and a ____on agacent carbon atom exchange places. In humans, a ____of vitamin B12 leads to a severe jondice called *pernicious anemia*. In industrial production of vitamin B12, microbial strains are ____ that have been specifically selected for the high ____of the vitamin. Cobalt is a metal found in vitamin B_{12} and yields of the vitamin are ____by addition of small amounts of cobalt to its culture medium. The fungus *Ashbya gossypii* nurally produces huge ____of riboflavin.

13. Give the names of the following vitamins: B, B2, B12, D, E, R, D.

14. Match the synonyms and use them in situations.

transfer, cause, use, purpose, ground, consider, important, principal, urgent, transport, fundamentals, foreign, apply, immediate, reason, aim, basis, add, supply, task, provide, essential, foundation, utilize, study, supplement, transportation, goal, alien.

15. Give the antonyms of the following words.

soluble, normal, relevant, suffucient, polished, use, digested, intramolecular, order, employed, excess, increased, decrease, exclude.

16. Learn the derivatives and use them in situations.

amination – amine – aminate – aminasin – aminogluoside – transamination, absorb – sorbent – sorbtion – absorption – adsorption – resorption, anabolic – anabolism – catabolic – catabolism – metabolic – metabolism, catalyze – catalist – catalized – catalizing, stage – state – establish – static – constituent – substituent – substitution, consist – consistency, ingest – digest – digestion – indigestion.

17. Find the words to match the definitions.

pernicious anemia, growth factors, the parent compound of flavins, *Ashbya gossypii,* the power houses of biological cells, bacteria that lives in the guts, power houses of biological cells.

18. Define the notions.

vitamin, flavin, intake, absorbtion, pharmaceutically, commercially, synthesis, biocatalist, intestines, intramolecular, subsistuent, dificiency, ingested, inbred.

19. Prepare the text for the back translation.

20. Analyze tense and voice of the verbs in the text. Use them in the sentences. Define the functions of the gerunds.

21. Find in the text and translate the sentences with the pronouns it, that**.**

22. Use Gerund – V-ing form in noun positions after the models.

Model 1. Subject. Studying is useful.

Model 2. Object. I like studying.

Model 3. Attribute. Doctors warn about the danger of catching infection.

Model 4. Part of a compound nominal predicate. Our duty is

producing quality drugs.

Model 5. Complex object. verb + your / her/ his/our / their. I remember her saying so.

Model 6. Adverbial modifier. Preposition / connective phrase + Gerund. The preparation was dried after processing.

1) after, before, since, at, on, till, until, from, about, by, of, in, for.

2) by means of, by way of, by method of, but for, instead of, in place of, in spite of, regardless of.

23. Join each pair of the sentences below into one transforming one of them into the participial complex.

1. The name vitamin has been given to a heterogeneous group of substances. They are required in only trace quantities in the diet. 2. Chemically they bear little or no relationship to one another. Many require a trace element to activate them. 3. Antibiotics do not distinguish between alien and beneficial bacteria. Anyone who takes them should supplement their intake of the relevant vitamins to compensate for this. 4. Thiamine, when in insufficient supply, gives rise to beri-beri. This disease is common to countries where polished rice is a major article of diet. 5. Absence of it leads progressively to loss of appetite, nausea, neuritis. The symptoms are due to degeneration of the nerve sheath, muscular convulsions, and cardiac disturbance. 6. The body has no storage site for the vitamin. There must be a regular supply of thiamine. 7. The vitamin must be converted to a nucleotide before it becomes active. It then acts as a coenzyme, 8. The vitamin is produced in the plant world by germinating seeds and growing shoots. In man it is produced by intestinal bacteria. 9. Vitamin is transported from the gut to the mitochondria. It take part in the production of energy.

24. Fill in the gaps with prepositions and conjunctions.

Riboflavin is synthesized ____ many microorganisms, including

competition between the microbiological and strictly chemical synthesis. ____ ingested ____ inbred, it is transported ____ the gut ____ the mitochondria – known ____ the power houses ____ biological cells to take part ____ the production of energy. Deficiency symptoms are inflammation ____ the tongue, lesion ____ mucocutaneous junctions ____ the eyes and lips, congestion ____ conjunctival blood vessels, ____ desquamation ____ the skin. It is a bright yellow pigment, and ____ this reason it, and a phosphate derivative ____ it, are permitted food colours. Vitamins K (quinon), D (sterol), biotin ____ folic acid are other vitamins produced ____ intestinal bacteria.

25. Discuss the problems using the Gerund as well as the argumentation and connective words.

1.The sources of vitamins B_2, B_{12}, D, E. 2. Their functions in human metabolism. 3. The symptoms of the vitamins dificiency. 4. Microbial sources of vitamins. 5. Molecular structure of vitamins

It is worth while investigating the problem. He is worth / he deserves his merits. It's worth nothing. The object is worthy / unworthy. It concernes

The discussion is useful / useless. It's usefullness / uselessness is evident. It's of some / no use / to me. What's the use?

What's the reason? What's the purpose? for the purpose, for this purpose / to no purpose, there is every reason / It's evident, it goes without saying / for this reason, for many reasons, give your reasons / grounds

supply examples, cause a problem, on condition, suffice to say, it is not surprising that, due to, owing to, concerning

26. Translate the text into English.

Вітаміни (від лат. vita – життя) – низькомолекулярні природні органічні сполуки різної хім. структури, обов'язкові учасники обміну

речовин у живих організмах. За фізико-хімічними властивостями вітаміни поділяють на розчинні в жирах – ліповітаміни та розчинні у воді – гідровітаміни. Мікроорганізми містять багато вітамінів, які частіше за все є коферментами. Деякі вітаміни мікроорганізми синтезують самі, інші засвоюють в готовому стані з навколишнього середовища. Культура, яка здатна синтезувати будь-який вітамін, називається аутотрофною по відношенню до нього; культура, що не здатна синтезувати даний фермент, є аутогетеротрофною відносно цього ферменту.

Синтез рибофлавіну (вітаміну B_2). Найбільшу продуктивність щодо біосинтезу рибофлавіну має дріжджеподібна культура *Eremothecium Ashbuii*, яка дає до 6000 мкг рибофлавіну на 1 г сухих речовин живильного середовища. Максимальну кількість рибофлавіну утворюється на другий день культивування. Мікроорганізм *Eremothecium Ashbuii* розвивається і синтезує рибофлавін на синтетичних середовищах із зменшеним вмістом вуглеводів (0,25-1,5%) і підвищеною кількістю пептону (1-5%) в присутності вітамінів - тіаміну, біотину та інозиту, а також амінокислот - лейцину, аргініну, метіоніну, гістидину і тирозину. Біосинтез рибофлавіну стимулюють ацетат амонію і ненасичені жирні кислоти. Цей процес гальмується залізом, тому живильне середовище попередньо обробляють для зменшення вмісту заліза до 5-10 мкг на 1 л.

В промислових умовах живильне середовище готують з 1-3% меляси, гідролу чи глюкози, 3-8% кукурудзяного екстракту чи дріжджового автолізату, з додаванням N. P_2O_5, K, Mg, Zn. Процес ведуть за методом глибинної ферментації при інтенсивності аерації 1,5-2,0 $м^3$/мм повітря і температурі 29-30°С. Ферментація проводиться до стадії лізису міцелія і утворення спор.

Part II

27. Read and sum up the text.

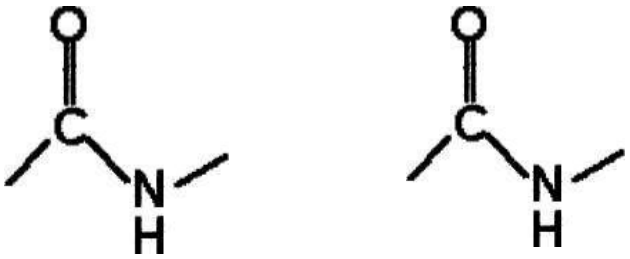
Essential Amino Acids

Humans could not make from their own resources all the amino acids they needed to fabricate the multitude of proteins required for an active and healthy human organism though they are needed only in trace quantities. So far as essential amino acids are concerned, it may be possible to provide a mixture of protein sources, as in the addition of soya flour to white flour, to ensure a reasonable supply but, since all essential acids can be synthesized it is also possible to make up deficiencies.

All but lysine and threonine are used in the transamination processes referred to when dealing with the vitamin, pyridoxine, earlier. Among the sources of protein in commonest use for food, the acids most likely to be in short supply are lysine, methionine, and tryptophan, with isoleucine on the borderline. Unfortunately tryptophan is the most difficult of the amino acids to estimate, and results must be viewed with caution. Lysine is low in wheat, corn, oats, rice, potatoes, groundnut, sunflower, sesame, and rape, methionine in wheat, oats, peas, soya bean, groundnut, cottonseed, and rape, and tryptophan (keeping the reservation in mind) in corn, beans, peas, and potatoes.

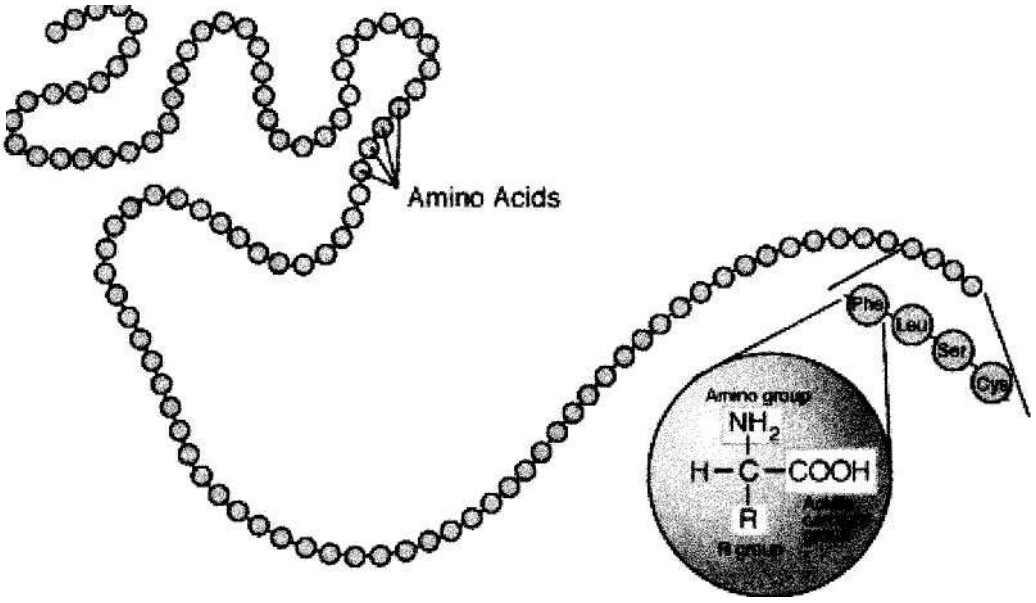
In general, the vitamins A, B, (thiamine), B_2 (riboflavin), nicotinic acid, C (ascorbic acid) and D are those of the most importance to the nutritionalist. However, folic acid and pyridoxine may possibly need to be considered among the vitamins of nutritional interest. The other vitamins are regarded as being of medical rather than nutritional interest as dietary deficiencies are so rare.

Amino acids have extensive uses in the food industry, as food



Rezonance stabilization forms of the peptide bonds

Primary protein structure
is sequence of a chain of amino acids



Amino Acid

Figure 6

additives, in medicine, and as starting materials in the chemical industry. There are 8 of them out of a total of 20 that are used on the he FAO/WHO permitted list. The acids most likely to be in short supply are lysine, methionine, and tryptophan. The most important commercial amino acid is glutamic acid, which is used as a flavor enhancer monosodium glutamate (MSG). Two other important amino acids, aspartic acid and phenylalanine, are the ingredients of the artificial sweetener aspartame, a non-nutritive sweetener of diet soft drinks and other foods sold as low-calorie or sugar-free products. Aspartame is a dipeptide of aspartate and the methyl ester of phenylalanine. Lysine, an essential amino acid for humans and certain farm animals, is commercially produced by the bacterium *Brevibacterium flavum* for use as a food additive.

Because amino acids are used by microorganisms as building blocks of enzymes and other proteins, strict cellular regulation of their production generally occurs. The production of lysine in *Brevibacterium flavum* is bio-chemically controlled at the level of the enzyme aspartokinase; excess lysine feedback inhibits activity of this enzyme. However, overproduction of lysine can be obtained by isolating mutants of *B. flavum* in which aspartokinase is no longer subject to feedback inhibition. This is done by isolating mutants resistant to the lysine analog S-aminoethylcysteine (AEC); which binds to the aliosteric site of aspartokinase and shuts down activity of the enzyme. AEC-resistant mutants, which are easily obtained by positive selection, produce a modified form of aspartokinase with an aliosteric site that no longer recognizes AEC *or* lysine, and thus feedback inhibition by lysine is greatly reduced. Such mutants of *B. flavum* can produce over 60 g of lysine per liter in industrial fermentors, a concentration sufficiently high to make the process commercially viable.

28.Ask questions of different kinds on the text.

29. Prepare the abstract of the text using introductory and connective words and learn it by heart.

30. Find in the text the following word combinations and translate them into Ukrainian.

essential amino acids, fabricate the multitude of, in trace quantities, to ensure a reasonable supply, on the borderline, the most difficult to estimate, must be viewed with cautionin, in terms of, overall protein intake, to express this, i.e., when dealing with, most likely, in short supply, following comment is relevant, the most importance to the nutritionalist, of nutritional interest, regarded as be low / high in wheat / amino acids, in general, need to be considered, dietary deficiencies, soft drinks, fairly well understood, much stricter control, available diet, provides excess lysine feedback, subject to feedback inhibition, shuts down activity, inhibition by lysine, greatly reduced, sufficiently high, commercially viable.

31. Find in the text the English equivalents of the following Ukrainian word combinations.

широке вживання, харчові добавки, незамінні амінокислоти, в недостатній кількості, поповнити дефіцит, штучний підсолоджувач, нехарчова амінокислота, підсилювач смаку, низькокалорійний продукт, продукт без цукру, для використання, суворі обмеження, на рівні фермента, стримує діяльність ферментів, обмеження зворотнього зв'язку, надмірне виробництво лізину, можна отримати, який опирається, зв'язує позицію, припиняє діяльність, зменшує стримування.

32. Fill in the gaps.

estimate, make up, essential, referred to, caution, provide, concerned, quantities, missing, dealing, supply, intake, permitted.

Amino acids are needed only in trace ____. These ____ ones must therefore be present in the dietary ____, and they are called ____ amino acids. There are 8 of them out of a total of 20 that are used on the he FAO / WHO ____ list. So far as essential amino acids are ____, it may be possible to ____ a mixture of protein sources to ensure a reasonable

____ but, since all essential acids can be synthesized it is also possible to ____ deficiencies. All but lysine and threonine are used in the transamination processes ____ when ____ with the vitamin, pyridoxine, earlier. Unfortunately tryptophan is the most difficult of the amino acids to ____, and results must be viewed with ____.

33. Use the synonyms in situations.

need, require, want; miss, lack, short of; call, refer to as, name, entitle; restricted, limited, measured; permit, allow, let; nutritive, nourishing, edible; micronutrient, trace element; fabricate, produce, manufacture, supplement.

34. Find the words to match the notions.

essential amino acids, dietary control, *Brevibacterium flavum,* AEC-resistant mutants, a non-nutritive sweetener of diet soft drinks and other foods, an essential amino acid commercially produced by the bacterium *Brevibacterium flavum*.

35. Prepare the text for the back translation.

36. Discuss the problems using the Gerund as well as the argumentation and connective words.

1. Essential aminoacids . 2. Micrbial sources of amino acids. 3. Amino acids permitted as food additives.

37. Translate the following abstract into English.

Амінокислоти – органічні кислоти, що мають у своєму складі одну або кілька аміногруп ($–NH_2$) та карбоксильних груп (–COOH). Усі амінокислоти – безбарвні кристалічні речовини, переважно розчинні у воді. Входять до складу всіх білкових речовин, багатьох ферментів, гормонів тощо. Залежно від положення аміногрупи щодо карбоксильної групи розрізняють α-, ß-, γ- та інші амінокислоти.

Особливе значення мають α-амінокислоти – найбїльша група амінокислот. Відповно до кількості амінокарбоних груп у молекулі амінокислоти поділяють на моноаміномонокарбонові чи моноаміно-дикарбонові та діаміномонокарбонові. Залежно від голови раликала амінокислоти можуть іти до аліфатичного ряду або мати циклічний характер.

Отримують амінокислоти при гідролізі білка та шляхом синтезу. З білків виділено близько 25 амінокислот. На відміну від рослин і багатьох мікроорганізмів, організм людини і тварин деякі амінокислоти (т. з. незамінні амінокислоти – *треонін, валін, лейцин, ізолейцин, лізин, триптофан, фенілаланін, метіонін, гістидин)* не синтезує. Вони надходять до нього з білками їжі. Більшість мікроорганізмів здатні синтезувати *de novo* всі 20 амінокислот, з яких складаються білки. Вуглецеві скелети амінокислот будуються з проміжних продуктів обміну, аміногрупи вводяться *прямим амінуванням* або *трансамінуванням.* Нітрати, нітрити, молекулярний азот (джерела азоту в поживних середовищах) попередньо відновлюються до аміаку (асиміляційна нітратредукція) і тільки після цього включаються до складу органічних сполук.

Лише небагато амінокислот утворюються в результаті *прямого амінування* вільними іонами амонію. У первинній асиміляції аміаку беруть участь *L-глутаматдегідрогеназа* та *L-аланіндегідрогеназа,* які здійснюють відновлювальне амінування 2-оксокислот (пірувату та 2-оксоглутарату). АТФ у цьому процесі участі не бере. Утворення глутаміну з глутамату каталізується *глутамінсинтетазою* і потребує витрат АТФ. За допомогою *глутаматсинтази* аміногрупа глутаміну може бути перенесена на 2-оксоглутарат з утворенням глутамату.

LESSON 11

The Gerund. The Participle.

Part I

1. Read and memorize the following words and word combinations.

impart rigidity to	надавати міцності
intracellular	внутрішньоклітковий
capsular slime	капсулярна грязь
residue	осад
sufficiently	досить
empede	прискорювати
predominate	переважати
impure needle	нечиста голка
adjustment	регулювання
primer	затравка
vessel	ємкість
ingest	вводити
administer	призначати
precursor	попередник
concomitant	одночасний
parenteral infusion	внутрішнє вливання
blood-volume	об’єм крові
expander	розширювач
excretion from kidneys	виведення з нирки
expander	розширююче

2. Find the international words in the text and give their Ukrainian analogues.

3. Translate the affixed parts of speech into English.

внутрішньоклітинний, позаклітинний, одноклітинний, структурний, багатоклітинний, екзосахадид, полісахарид, дисахарид, амилосахарид, мікробний, цитоплазменний, молекулярний, ферментований, ферментуючий, цукраза, біосинтетичний, метаболізм, метаболічний, специфічний, стабільний.

4. Make up the complex words.

lipid, association; amilasa, saccaride; glucose, pyranozol; extra, cell; cell, bind; microbe, organism; beet, sugar; glucosyl, transferase; biology, synthesis; concomittant, product ; out, let; cortison, steroid.

5. Study the text to prove the enzymatic origin of microbial polysaccarides. Read and translate the text.

Microbial Polysaccarides

Polysaccharides of microorganisms occur as intracellular-storage amylosaccharides. They are lipid-associated substances in conjunction with cytoplasmic membranes, structural glycans that impart rigidity to cell walls, both discrete and diffuse capsular slimes that remain attached to the cells, and extracellular products in the media. Only the capsular and extracellular (exo-) polysaccharides can be produced in sufficiently high yields to merit commercial interest. Because physical, chemical, and enzymatic means are required to free the capsular types from cells, these types generally have not been considered for industrial production.

Xanthan gum, the extracellulas polysaccaride of *Xantomonas campestria* B-1459 was the first biosynthetic product of a fermentation based on corn sugar that attained commercial interest due to the sufficient yield. Xanthan gum was approved by FDA for use as a food additive.

Dextrans are α-D-glucans in which (1 → 6) linkages predominate, ie, 50% or more of the a-D-glucopyranosyl residues are linked as such. Dextrans

are produced from sucrose by bacteria belonging to the genera *Leuconostoc, Streptococcus,* and *Lactobacillus,* all of which are in the family *Lactobacillaceae.* The majority of known dextrans is formed by strains of *Leuconostoc mesenteroides.* Because they interfere in the production of sucrose, dextrans were the first extracellular microbial polysaccharides to be investigated. Aside from impeding the filtration and handling of cane and beet-sugar juices, dextran causes sucrose to crystallize in the form of impure, elongated needles.

Biosynthesis of dextran from sucrose was the first direct enzymic polymerization demonstrated for a disaccharide donor substrate. The reaction is catalyzed by an inducible enzyme, dextransucrase (sucrose:1,6-a-D-glucan 6-a-D-glucosyltransferase, E.C.2.4.1.5), which may be either cellbound or extracellular.

Sucrose is the only donor substrate known and it is the initial acceptor; repetitive a-D-glucopyranosyl transfer occurs so rapidly that high molecular weight products are formed without detectable oligosaccharide intermediates. At high concentrations, (10-70%) sucrose competes as the acceptor with growing dextran chains, and low molecular weight products are formed.

Enzymatic biosynthesis. In industrial production of dextran, the extracellular enzyme is used. Initially, dextransucrase is produced. After adjustment of culture pH and removal of cells, the culture fluid is distributed into vessels containing sugar solutions (and, perhaps, low molecular weight dextran primers) where the polymerization reaction takes place. Advantages of this approach are more efficient use of equipment, virtually complete conversion of substrate into product; ease of product recovery and purification; control of reaction conditions; ie, pH, temperature, and primer addition; and the possibility of recovering the coproduct D-fructose, which otherwise would be consumed by the cells metabolically with concomitant production of lactic acid.

Maximum elaboration of dextransucrase by *L. mesenteroides* NRRL B-

512 (F) occurs in cultures that are maintained at pH 6.7. The enzyme is unstable at that pH but has maximum stability and activity at pH 5.0-5.2. Because the activity of dextransucrase is highly sensitive to temperatures above 25°C, incubation temperatures do not exceed 30°C. A sucrose level of 2% is optimal for enzyme production, because higher levels lead to formation of an amount of dextran that interferes with removal of cells.

Unlike most other microbial polysaccharides, the utility of B-512 (F) dextran depends much less on its ability to impart high viscosity to aqueous solutions than on its inherent structural features. For example, a 2% sol (polymer wt / soln wt) of the dextran at 25°C gives a viscosity of ca 100 m Pa-s (= cP); the same concentration of xanthan gum displays a viscosity of ca 7 Pa-s (70P). The useful characteristics of B-512 (F) dextran derive from its primary structural features, whereas the properties of xanthan gum arise from secondary and tertiary macromolecular structural effects.

Pharmaceutical uses probably are the main outlets for dextran. Clinical use of dextran as fractions having specific molecular size ranges is based on its compatibility with human tissues and complete metabolic utilization, whether it is ingested or administered parenterally. Material of M_w 75,000 ± = 25,000 is specified for parenteral infusion as a blood-volume expander in treatment of shock, eg, from hemorrhage or bums; the lower limit was set because lower molecular-weight material clears too rapidly through excretion from the kidneys.

6. Ask questions of different kinds on the text.

7. Write the plan of the text.

8. Write an abstract of the text.

9. Find in the text the following word combinations and translate them into Ukrainian.

in conjunction with, impart rigidity to, remain attached, means are

required, generally considered for, attained commercial interest, sufficient yield, was approved by, linkages predominate, the majority of, aside from, impeding the filtration handling, impure needles, repetitive transfer occurs, without detectable intermediates, competes with, low molecular weight, after adjustment of culture, the culture fluid, distributed into vessels, more efficient use of equipment, ease of product recovery and purification, with concomitant production of, compatibility with human tissues, ingested or administered parenterally, parenteral infusion, as a blood-volume expander, the lower limit was set, clears too rapidly, through excretion from the kidneys.

10. Find in the text the English equivalents of the following Ukrainian word combinations.

зустрічатися як, у середовищі, в достатньо великій кількості, вивільняти з клітини, економічна значущість, для промислового виробництва, завдяки цьому, для вживання, пов'язаний з, належати до роду, утворюється штамами, спричиняти кристалізацію, висока молекулярна вага, містити цукровий розчин, у високій концентрації, переваги такого підходу, видалення клітин, реакція має місце, умови реакції, споживатися клітинами, підтримувати РН, водний розчин, не перевищувати, вищий рівень, виявляє в’язкість, властивості гуми, лікування шоку, молочна кислота, походити від.

11. Fill in the gaps.

advantages, derive, attached, conjunction, adjustment, interfere, recovery, level, impart, yields, approved, impeding, causes, acceptor, intermediates.

Polysaccharides are lipid-associated substances in ____ with cytoplasmic membranes, structural glycans that ____ rigidity to cell walls, both discrete and diffuse capsular slimes that remain ____ to the cells. Only the capsular and extracellular (exo-) polysaccharides can be produced in sufficiently high ____ to merit commercial interest. Xanthan gum was ____

by FDA for use as a food additive. Because they ____ in the production of sucrose, dextrans were investigated. Aside from ____ the filtration and handling of cane and beet-sugar juices, dextran ____ sucrose to crystallize in the form of impure, elongated needles. Sucrose is the only donor substrate known and it is the initial ____ High molecular weight products are formed without detectable oligosaccharide ____. After ____ of culture pH and removal of cells, the culture fluid is distributed into vessels containing sugar solutions. ____ of this approach are: virtually complete conversion of substrate into product; ease of product ____ and purification, etc. A sucrose ____ of 2% is optimal for enzyme production. The useful characteristics of B-512 (F) dextran ____ from its primary structural features.

12. Match the synonyms and use them in situations.

bacteria, environment, happen, quantity, contribute, connect, attract, supplement, species, enhance, microorganism, occur, bring in, attach, administer, yield, draw, media, additive, kind, stimulat, combination, direct, desintegrate, require, digestive, alimentary, split, fall into parts, compound order.

13. Give antonyms of the words.

anaerobic, similar, isolate, enhance, available, narrow, active, absorbe negative, effective, applied, limited, compatibility, discrete.

14. Interpret the words with their derivatives and make up situations with them.

sugar – sugary – sucrase – dextransucrase – sucrosa – saccaride – disaccaride – monosaccaride – oligosaccharides – polysaccharides – (exo-) polysaccharide, inhibit – ingibitor – inhibited – inhibiting, add – addition –additive – added – adding.

15. Match the abbbreviations and their word forms.

1) NADN, FDA, pH, °, C, ca, mPa·s, cP, soln, P, eg, M_w.

2) degrees, Celcyn, solution, nicotinamidadenindinucleatid, exampli gracia (for example), molecular weight, hydrogen ions concentration, Food and Drug Administration, circa (приблизно), millipascals per second, centipoise, poise.

16. Use the text to give the definitions to the notions.

intracellular, extracellular, (exo-) polysaccharides, Xanthan gum, Dextran, *Leuconostoc,* dextransurcasa.

17. Make up word combinations.

1) donor, initial, occurs, food, high, unstable, impart, cell, capsular, remain, sufficient, to merit, corn, culture, inherent, molecular, dextran efficient, complete, product, reaction, conditions, primary, impeding .

2) yield, enzyme, weight, primers, use, recovery, addition, sugar, rigidity, features, interest, acceptor, slimes, walls, transfer, attached, rapidly, fluid, additive, solutions, conversion, substrate, viscosity, filtration.

18. Match the colloquial word combinations and the words – their official correspondences.

1) put in, take out, break up, give out, make into, look into, make up, set up, let in, let out, give life to, give to, put together, keep up.

2) introduce, impart, insert, research, convert, extract, injest, reproduce, release, establish, remove, study, split, maintain, link, join, couple, connect, attach, investigate, create, produce, yield.

19. Prepare th text for the back translation.

20. Analyze tense and voice of the verbs in the text. Use them in the sentences. Define the functions of the gerund and the participle.

21. a) Make up sentences with the gerund in the function of a subject / object – the name of a profession, occupation, or process.

Model 1. Treating alkali with acid results in carbon dioxide.

Model 2. Try treating alkali with acid.

b) Use the gerund after the phrases: It is no use / good, there is no point in, smb get used to, smb is looking forward to.

22. Substitute the infinitives or noun-groups with the gerunds.

Model. The experiment needs to be repeated.The experiment needs repeating.

Only the capsular and extracellular (exo-) polysaccharides can be produced in sufficiently high yields to merit commercial interest. Because physical, chemical, and enzymatic means are required to free the capsular types from cells, these types generally have not been considered for industrial production. To have fermented Xanthan gum corn sugar was used. To have investigated Dextrans proved the useful properties of this microbial polysaccharide. To biosynthesize dextran from sucrose was the first direct enzymic polymerizatiom for a disaccharide donor substrate. Aside from impeding the filtration and handling of cane and beet-sugar juices, dextran causes sucrose to crystallize in the form of impure, elongated needles.

23. Use the gerund, the participle, the infinitive, as well as the argumentation and connective words in the dialogues on the following topics.

1. Chemical composition of polysaccarides. 2. Commercial value of certain polysaccarides. 3. Stages of Dextran production. 4. Conditions of Dextran production. 5. Medical application of Dextran.

One can't be too sure. I assure you. The results insure hope for / certainty. The results are reassuring / convincing.

I can give every proof / evidence of the fact. I can prove it. It is a proved / unproved fact. whatever proofs may / might be

be / sound logical / illogical

I am of opinion that / my opinion is / in my opinion, my view-point / point of view / from all points of view, in view of, with the view of, bring into view, object in view

rely on the experience, stand on the firm ground, utter a hypothesis

24. Translate the text into English.

Практична значущість мікробних полісахаридів зумовлена їх спроможністю в невисоких концентраціях істотно змінювати реологічні характеристики водних систем. Згідно з класифікацією англійського вченого І. Сазерленда мікробні ЕПС належать до п'яти груп.

Перша група містить декстрани і споріднені полісахариди (левани, мутанти). Вони складаються з моносахаридів одного типу, тобто є гомополісахаридами. Синтез цих ЕПС здійснюється на середовищах, що містять сахарозу як специфічний субстрат. Продуцентами МПС першої групи є представники родів *Streptococcus* і *Leuconostoc. Декстран (а-Б-глюкан)* продукується бактеріями *Leuconostoc mesenteroides*, *Streptococcus bovis*, *Streptococcus viridans.* Декстран використовується як замінник плазми, а також для аналітичних досліджень у хімії та біології.

МПС *другої групи* є гетерополісахаридами. Нині встановлено утворення такого МПС жовтозабарвленою псевдомонадою.

До *третьої групи* належать гомополісахариди, що синтезуються на різних вуглецевих субстратах. Деякі з цих гомополісахаридів складаються лише з вуглеводів, наприклад, бактеріальна целюлоза або пулулан (продуцент *Aureobasidium pullulans), інші,* вміщують ацетильні групи. *Курдлан* – ß (1 – 3)-глюкан – синтезується бактеріями *Alcaligenes faecalis* та *Agrobacterium radiobacter.* Завдяки стійкості до температури та кислот курдлан використовують у харчовій промисловості, а також для приготування мікробіологічних середовищ.

Четверта група мікробних ЕПС найчисленніша. її представники являють собою гетерополісахариди, які складаються із структур з повторюваними блоками. До цієї групи належить найбільш досліджений

мікробний ЕПС – ксантан (продуцент *Xanthomonas campestris* NRRL B-1459) , а також промислово цінні ЕПС – гелан і емульсан.

Part II

25. Read and sum up the text.

Steroids and the Biotransformation Process

Steroids are derivatives of sterols, and are animal hormones that regulate various metabolic processes. Some steroids are also used as drugs in human medicine. Members of one group the *corticosteroids* are effective therapeutic agents in controlling the symptoms of arthritis and allergies. Members of another group, the *estrogens* and *androgenic steroids,* play a role in human fertility, and some of them can be used therapeutically in the control of fertility or as stimulants for building muscle mass.

Steroids can be obtained by complete chemical synthesis but this is a complicated and expensive process. Certain key steps in chemical synthesis can be carried more efficiently by microorganisms, and thus commercial production of steroids typically involves at least one microbial step. Most steroids are produced industrially by the process of biotransformation. This involves growth of the organism in large fermentors, followed by the addition at the appropriate time of a sterol precursor. The latter is obtained from inexpensive starting material, typically stigmasterol, a by-product of the soy industry. Following an incubation period during the sterol precursor is biotransformed, the fermentation broth is extracted and the sterol purified.

In the production of hydrocortisone and cortisone, corticosteroids used to reduce swelling and itching from KT skin irritations, the fungus *Rhizopus nigricans* carries a key biotransformation, the stereospecific hydroxilation of a cortisone precursor. Most steroid biotransformations involve hydroxylations

of this type, and a variety of different fungi are used industrially to carry out the stereospecific hydroxylation of the steroid at a particular site on the steroid molecule. Although most biotransformations are not beyond the possibilities of organic chemistry, microorganisms carry out the reactions more economically. Steroid production is currently a big business, as worldwide sales of the four major corticosteroids, *hydrocortisone, cortisone, prednisone,* and *prednisolone,* amount to over 800 tons / year.

26. Ask questions of different kinds on the text.

27. Write an abstract of the text.

28. Find in the text the following word combinations and translate them into Ukrainian.

human medicine, members of one group, therapeutic agents, human fertility, complicated and expensive process, certain key steps, commercial production, involves at least, followed by the addition of, at the appropriate time, the latter, inexpensive starting material, is extracted and purified, to reduce swelling and itching, skin irritations, a variety of different fungi, to carry out the stereospecific hydroxylation, at a particular site, beyond the possibilities of, is currently a big business.

29. Find in the text the English equivalents of the following Ukrainian word combinations.

похідний стеролу, використовуються як ліки, корисні сполуки, терапевтичні засоби, плідність людини, отримані повністю хімічним синтезом, здійснюватися мікроорганізмами, включати стадію, складний процес, попередник стеролу, недорогий матеріал, додавання матеріалу, побічний продукт, вслід за, ферментаційний бульйон, використовується в промисловості, проводити реакцію, головна біотрансформація, ділянка на молекулі, поза можливості, в наш час, світові продажі сягають.

30. Fill in the gaps.

precursor, extracted, following, derivatives, drugs, site, agents, fertility, obtained, inexpensive, reduce, amount, complicated, involve.

Steroids are ____ of sterols. Some steroids are also used as ____ in human medicine. Members of one group the *corticosteroids* are effective therapeutic ____ in controlling the symptoms of arthritis and allergies. The *estrogens* and *androgenic steroids,* play a role in human ____. Steroids can be ____ by complete chemical synthesis but this is a ____ and expensive process. The process of biotransformation ____ growth of the organism in large fermentors, followed by the addition at the appropriate time of a sterol ____. The latter is obtained from ____ starting material, typically stigmasterol, a by-product of the soy industry. ____ an incubation period during the sterol precursor is biotransformed, the fermentation broth is ____ and the sterol purified. In the production of hydrocortisone and cortisone, corticosteroids are used to ____ swelling and itching from KT skin irritations. A variety of different fungi are used industrially to carry out the stereospecific hydroxylation of the steroid at a particular ____ on the steroid molecule. Worldwide sales of the four major corticosteroids, *hydrocortisone, cortisone, prednisone,* and *prednisolone,* ____ to over 800 tons / year.

31. Explain the notions.

steroid, sterols, *corticosteroids,* stigmasterol, biotransformation process, estrogen, inexpensive, industrially, by-product, fertility.

32. Prepare th text for the back translation.

33. Use the gerund, the participle, the infinitive, as well as argumentation and connective words in the dialogues on the following topics.

1. Steroids nature. 2. Medical importance of steroids. 3. Methods of steroids production. 4. Biotransformation process and its economical advantage. 5. The use of hormones in food industry – for and against.

34. Read, translate and sum up the text.

У1948 р. вперше введено гідроксильну групу в молекулу стероїда мікробіологічним шляхом. Але тільки після одержання 11а-гідроксипрогестерону з прогестерону у процесі ферментації останнього з культурою *Rhizopus nigricans* мікробіологічні трансформації стероїдів привернули до себе велику увагу. Використання мікроорганізмів дозволяє замінити численні хімічні операції трансформації стероїдів однією-єдиною стадією. Впровадження мікробіологічного синтезу в процеси одержання стероїдних гормональних препаратів у фармацевтичній промисловості дало можливість відразу значно здешевити виробництво цінних препаратів.

Для трансформації 1-2 г стероїдів використовуються ферментатори. Розчинність стеринів у воді дуже низька. Тому стерини в концентрації приблизно 1 г / л вносять у ферментатор розчиненими у малотоксичних розчинниках (ацетон, спирт, диметилформамід), які змішуються з водою.У більш високих концентраціях (вище 1 г / л) стерини вносять у середовище у вигляді пудри. Другий спосіб введення стеринів у середовище полягає в тому, що стерин, наприклад, Р-ситостерин, розчиняють у суміші гептанетиленхлорид, добавляють під час перемішування воду і відганяють розчинник нагріванням суміші до 95 °С. За такого методу концентрація ситостерину у водній суспензії може досягати 140 г / л.

Після завершення трансформації культуральна рідина, звільнена від біомаси, екстрагується органічними розчинниками, які не змішуються з водою, але в яких розчиняються відповідні стероїди (етилацетат, метиленхлорид, хлороформ). Екстракт відділяють від водної фази, очищують (забарвлені домішки відділяють обробкою активним вугіллям, після чого вугілля відфільтровують); далі його концентрують у вакуумі, осад стероїду перекристалізовують з відповідного розчинника.

LESSON 12

Gerundial Complexes

Part I

1. Read and memorize the following words and word combinations

reactant	реактив
distinctive feature	відрізняюча риса
couple, join	приєднувати(ся)
elimination, removal	видалення
precursor	попередник
laundry detergent	миючий засіб
alkaline solution	лужний розчин
corn starch	кукурудзяний крохмаль
wheat	пшениця
soft drink	безалкогольний напій
commodity chemical	хімікат – товар
substrate	основа
strip	відділяти
alternative sources	інші джерела
demand exceeds supply	попит перевищує постачання
flavour	запах
prevent rancidity	випереджувати появу гіркоти
residual peroxides	осад перекисних сполук
enhance	прискорювати (реакцію)
souring cultures	зкислюючі культури
emergence	поява

2. Find the international words in the text and give their Ukrainian analogues.

3. Translate the affixed parts of speech into English.

апоензим, протеїн, кофактор, неорганічний, коензим, голоензим, монооксид, термостійкій, химотрипсин, метаболіт, абсорбція, трипсиноген, протеаза, оксидаза, полісахарид, лужний.

4. Make up the complex words.

self, sustain; (DPN), chlor; carbon, phosphor; pyridine nucleotide (TPN); carboxyl, pepsydase; milk, soure; juice, base; make, cheese.

5. Scan the text for the relationship of enzymes and coenzymes. Read and translate the text.

Enzymes And Coenzymes

Most of the chemical changes that occur in living tissues are regulated by biocatalysts, the enzymes. A catalyst is a substance that alters the speed of a reaction already in progress without appearing as part of the final products and without changing the energy content of the reactants and resultants. Enzymes comprise one class of proteins. Catalysts permit reactions to occur under milder conditions than would otherwise be possible.

All known enzymes contain a globular protein – apoenzyme, joined to a nonprotein compound known as a cofactor. The cofactor may be an inorganic ion or a small organic molecule called a coenzyme. Together the apoenzyme and cofactor form the holoenzyme. Most catalysts have a well-defined specificity. Thus carbon monoxide and hydrogen are converted to methane and water almost quantitatively when passed over nickel; but the same compounds yield methyl alcohol quantitatively in the commercial process using a mixture of zinc and chromic oxides; whereas, with alkali and iron, a mixture of higher alcohols, ketones, and hydrocarbons is obtained.

Enzymes are produced commercially from both fungi and bacteria. The microbial enzymes produced in the largest amounts on an industrial basis are the bacterial proteases, used as additives in laundry detergents.

Most laundry detergents today contain enzymes, chiefly proteases, but also *amylases, lipases, reductases,* and others. Many of these enzymes are isolated from alkaliphilic bacteria, mainly species of *Bacillus* such as *Bacillus licheniformis*. These enzymes, which have pH optima between 9 and 10, remain active at the alkaline pH of laundry detergent solutions.

Tenderizing meats can be achieved by reducing them to hydrolysates by means of the digestive enzymes, pepsin and trypsin. Proteases are enzymes that attack proteins in one way or another, and there is one more to be mentioned, rennin, which is used in cheese-making. The traditional source is a crude concentrate, rennet, prepared from the stomachs of calves. But not only does demand exceed supply from this source today, but there are also ethnic and religious scruples to be taken into account. So alternative sources have been sought and a number have been found: all, somewhat surprisingly, microbial – *Bacillus cereus, Endothia paraciticus, Irpex lacieus, Mucor michei,* and *Mucor pusillus.* The action of rennin is to reduce a 'water-soluble' milk protein, caseinogen, to casein, which then interacts with calcium present in the milk to form a cheese curd.

Glucose oxidase is used to prevent what is known as the Maillard – or browning – reaction between the aldehydic group of sugars and amino groups of proteins. Not that the reaction is always unwanted, for it helps to produce the colour and flavour of such products as bread, cakes, breakfast cereals, and roast meat. But it is not wanted in dried eggs, dried meat, and dehydrated potatoes.

This enzyme will also remove oxygen and has been used for this purpose in a number of processes: stabilizing citrus-juice-based soft drinks; co-stabilizing vitamins B_{12} and C in aqueous preparations; preventing rancidity (i.e. acting as an antioxidant) in oil / water emulsions, or oxidation of beer, or vinegarization of wine, or the browning of fresh fruit. The enzyme is isolated from the mould, *Aspergillus niger,* and this

remains the principal source.

Other important enzymes manufactured commercially are amylases and glucoamylases, which are used in the production of glucose from starch. The glucose so produced can then be converted by the enzyme *glucose isomerase* to produce fructose, which is about twice as sweet as glucose. The final result is the production of a *high-fructose syrup* from corn, wheat, or potato starch. High-fructose syrups are a big business, since they have a major market in the production of soft drinks. Worldwide production of high-fructose syrups is nearly 10 billion kilograms per year.

Next there are the carbohydrases in particular. Carbohydrases attack polysaccharide linkages and produce smaller and more easily digested sugar units. They are used for this purpose in the baking industry, and also for making 'modified starches', which can act as emulsifier stabilizers. Again the sources are microbial: *Arthrobucter, Aspergillus niger, Aspergillus crysae, Saccharomyces* spp., *Bacillus subtilis.* The FAO / WHO Expert Committee on Food Additives in considering the safety aspects of enzyme preparations proposed for use in food processing, has noted: “Only in exceptional cases are these enzymes used as crystallised pure substances.”

Finally there is catalase, a peroxidase, which has found use both in the dairy industry and in the pasteurization of eggs. It acts on hydrogen peroxide to release oxygen and produce water. There is, in fact, a coupled reaction in which one molecule of peroxide is oxidized and another reduced: In the dairy industry the enzyme is used to remove residual peroxides from milk that is to be used for cheesemaking, and also to stabilize and enhance the action of milk-souring cultures. The principal sources of the enzyme are *Aspergillus niger* and *Micrococcus lysodeikticus.* It is present in bovine liver but this does not provide a commercial source.

6. Say whether the following statements are true or false and

give your proofs why.

1. A catalyst is a substance that inhibits a reaction 2. Enzymes comprise one class of carbohydrates. 3. Catalysts permit reactions to occur under the extreme conditions. 4. Enzymes are produced commercially from fungi only. 5. The microbial enzymes produced in the largest amounts on an industrial basis are the amilases. 6. Rennin is used in breadmaking.7.There are no alternative sources today. 8. The action of rennin is to reduce a 'water-soluble' milk protein, caseinogen, to a cheese curd. 9. High-fructose syrups are a small business.10. Production and application of enzymes is not absolutely safe, is it?

7. Ask questions of different kinds on the text.

8. Write the plan of the text.

9. Write an abstract of the text with the key words and the connective words given below and learn your abstract by heart.

in particular, commonly, as follows, such as, at times, for example, both and, often, that is, not that, for, next, therefrom, in fact, finally.

10. Find in the text the following word combinations and translate them into Ukrainian.

produced commercially, the bacterial proteases, chiefly proteases, isolated from, have pH optima, at the alkaline pH, laundry detergent solutions, by reducing them to hydrolysates, by means of the digestive enzymes, prepared from the stomachs of calves, demand exceed supply, to be taken into account, alternative sources have been sought, a number have been found, the action of rennin, to reduce caseinogen to casein, interacts with calcium, present in the milk.

11. Find the English equivalents of the following Ukrainian word combinations.

великі кількості, використовуються як добавки, миючі засоби,

містити ферменти, види бактерій, залишатися активними, пом'якшення м'яса, можна досягти, підвищити сполуку до, діяти на білок, готувати з, використовуватися у сироварінні, шукати джерела, знайти джерела, водорозчинний білок, утворювати творог, сухі сніданки, водний препарат, випереджувати гіркоту, видаляти / вивільняти кисень, забезпечувати комерційне джерело.

12. Fill in the gaps.

coupled, souring, provide, linkages, converted, reducing, prevent, solutions, commercially, amounts, residual, additives, species.

Enzymes are produced ____ from both fungi and bacteria. The microbial enzymes produced in the largest ____ on an industrial basis are the bacterial proteases, used as ____ in laundry detergents. These enzymes, remain active at the alkaline pH of laundry detergent ____. Tenderizing meats can be achieved by ____them to hydrolysates by means of the digestive enzymes, pepsin and trypsin. Glucose oxidase is used to ____ browning reaction between the aldehydic group of sugars and amino groups of proteins. The enzyme is isolated from the ____ *Aspergillus niger.* The glucose so produced can then be ____ by the enzyme *glucose isomerase* to produce fructose, Carbohydrases attack polysaccharide ____ and produce smaller and more easily digested sugar units. There is, in fact, a ____reaction in which one molecule of peroxide is oxidized and another reduced. Catalas is used In the dairy industry to remove ____peroxides from milk that is to be used for cheesemaking, and also to stabilize and enhance the action of milk-____cultures. It is present in bovine liver but this does not ____ a commercial source.

13. Match the synonyms.

biocatalist, matter, take place, control, going on, include, attach, turn

into, go over, bring, receive, decompose, take, accumulate, give out, alter, substance, join, transform, change, occur, pass over, obtain, disintegrate, gather, yield, check, enzyme, continuous.

14. Give the antonyms of the words.

hydrated, organic, protein, stabilized, mobile, soluble, appear, regulated, joined, defined, quantity, compose, join, pick up, remove, substract, release, cold.

15. Interpret the words with their derivatives and make up situations with them.

ferment – fermentability – fermentable – fermentation – unfermentable, component – compound, compose – composition, protein – nonprotein – proteinous – proteinase, globular – globulin, react – reactant – reagent – reactive – reaction – reactivity – reactor, enzyme – coenzyme – apoenzyme – holoenzyme – enzymatic.

16. Find the words to match the definitions.

substance that alters the speed of a reaction already in progress, together the apoenzyme and cofactor, end product of fermentation, take in air, the biochemical pathway of fermentation, final product of the glycolytic pathway, undergo oxidation.

17. Explain the notions.

cofactor, holoenzyme, energy-yielding, multicellular, dehydrogenation, hydrogenation, *hydrogen donor, hydrogen acceptor,* q.v., DPN, TPN.

18. Explain the difference between the words.

mixture, solution, tincture, gele, suspension, emulsion; liquid, solid; quantity, quality; sugar, sucrase.

19. Prepare the text for the back translation.

20. Analyze tense and voice of the verbs in the text. Use them in the sentences. Find and and analyze the functions of the gerunds.

21. Use the gerund in place of the verbal nouns and the infinitives in bold type.

Energy is usually obtained from **the** orderly **breakdown** of organic compounds. The biological oxidation of organic compounds involves **the removal** of two hydrogen atoms; this reaction is called dehydrogenation. The reduction of such compounds involves **the addition** of two hydrogen atoms to an organic molecule. The hydrolysis of the energy-rich pyrophosphate bonds of ATP results in **the release** of large amounts of energy (8 kcal/mole). In living cells the energy released from breaking thepyrophosphate bonds of ATP is used **to drive** the various energy-requiring biosynthetic reactions. The bond energy of ATP is subsequently utilized in the biosynthetic reactions necessary for cell **growth** and **multiplication. The reduction** of such compounds involves the addition of two hydrogen atoms to an organic molecule; this reaction is called hydrogenation. Enzymes that catalyze the oxidation of organic compounds by **the removal** of hydrogen atoms are called *dehydrgenases.*

22. Replace the sentences and infinitives with the participles.

1. The pyruvic acid then may be reduced to form lactic acid, or it may lose carbon dioxide to form acetaldehyde, which is subsequently reduced to form ethyl alcohol. 2. A series of reactions in which some of the energy is released is stored for future use in the high-energy chemical bonds of a compound which are known as adenosine tri-phosphate (ATP)3. The compound that loses the hydrogen atoms is called the *hydrogen donor;* the compound that accepts hydrogen is called the *hydrogen acceptor.* 4. Enzymes that catalyze the oxidation of organic

compound by the removal of hydrogen atoms are called *dehydrogenases.* 5. Associated with these enzymes are two organic molecules that serve as temporary hydrogen acceptors; these molecules, which act as coenzymes (q.v.), belong to the class of organic molecules known as pyridine nucleotides.

23. Fill in the gaps with conjunctions.

Most of the chemical changes ____ occur in living tissues are regulated by biocatalysts, the enzymes. ____ carbon monoxide and hydrogen are converted to methane and water almost quantitatively ____ passed over nickel; ____ the same compounds yield methyl alcohol quantitatively in the commercial process using a mixture of zinc and chromic oxides; ____, with alkali and iron, a mixture of higher alcohols, ketones, and hydrocarbons is obtained. Enzymes are produced commercially from ____ fungi and bacteria. Bacterial proteases are used ____ additives in laundry detergents. Most laundry detergents today contain enzymes, chiefly proteases, ____ *amylases, lipases, reductases,* and others. These enzymes, ____ have pH optima between 9 and 10, remain active at the alkaline pH of this source today, ____ there are also ethnic and religious scruples to be taken into account. ____ alternative sources have been sought. Not that the reaction is always unwanted, ____ it helps to produce the colour and flavour of such products as bread, cakes, breakfast cereals, and roast meat. Fructose is about twice ____ sweet ____ glucose. High-fructose syrups are a big business, ____ they have a major market in the production of soft drinks.

24. Use the gerundial complexes as well as the argumentation and connection words in the dialogues on the topics.

1. Enzymes and catalists. 2. Enzymes origin and their chemical composition. 3. Sources of enzymes regarded as food. 4. Experiments on fermentation.

guide, leader, sponsor, supervisor, adviser in research; guided by / under the guidance of, leadership, sponsorship, supervision of

according to my convictions /as for me / as I am concerned, I am quite convinced. What are your cinvictions? My convictions are the same. That sounds / looks convincing / unconvincing.

process under consideration / examination / review / investigation / study / observation / test / way, undergo / underlie / undertake investigation, in due time, subject to

25. Translate the following text into English.

Усі процеси, в тому числі й окисно-відновні, що відбуваються в клітині, зумовлюються каталітичною участю ферментів. Ферменти, як правило, – складні речовини, побудовані з білків і небілкових компонентів – коферментів. Одним з таких коферментів (кофакторів) окисно-відновних ферментів є НАД – нікотинамідаденіндинуклеотид. Часто такими кофакторами ферментів є вітаміни. НАД складається з вітаміну РР (B_5) – нікотинаміду, аденіну, двох залишків рибози і двох залишків фосфорної кислоти. НАД може бути в окисненій і відновленій формах:НАД + H_2 →НАД · H_2 .

Загальне рівняння реакцій гліколізу можна записати так:

$$C_6H_{12}O_6+2АДФ + 2H_3PO_4 \rightarrow 2C_3H_6O_3 + 2АТФ + 2H_2O.$$

Глюкоза Молочна кислота

Ро́різняють шість осн. класів ферментів: 1-й – *оксидоредуктази;* 2-й – *трансферази;* 3-й – *гідролази;* 4-й – *ліази; 5-й – ізомерази;* 6-й– *лігази.* Залежно від хім. складу ферменти поділяють на прості й складні. П р о с т і ферменти – прості білки, побудовані тільки з залишків *амінокислот.* С к л а д н і ферменти – білки, молекула яких має ще небілкову частину, зокрема *кофермент.* Кофермент з'єднується з білковою частиною фермента *(апоферментом)* частіше слабким нековалентним зв'язком, здатним легко розщеплюватись, іноді – міцним

ковалентним зв'язком, утворюючи так звані простетичні групи, які залишаються приєднаними до молекули білка протягом всього каталітичного акту. Природний комплекс апоферменту з коферментом називається холоферментом. Каталітична активність ферментів зумовлена особливостями структури, яка визначається головним чином розміщенням різних амінокислот в молекулі. Як біокаталізатори, ферменти прискорюють хімічні реакції в біологічній системі, знижуючи енергію активації і не змінюючи положення рівноваги.

Part II

26. Read and sum up the text.

Fermentation Mechanism

Fermentation is an energy-yielding metabolic process that involves the decomposition of carbohydrates in the absence of oxygen. Fermentation occurs in many microorganisms and in some types of cells in multicellular plants and animals. The end product of fermentation may be an alcohol, such as ethyl alcohol, or an organic acid, such as lactic acid. The biochemical pathway of fermentation is known as *glycolysis.* In the course of this series of reactions glucose, which is a 6-carbon sugar, is broken down to two molecules of pyruvic acid, a 3-carbon compound. The pyruvic acid then may be reduced to form lactic acid, or it may lose carbon dioxide to form acetaldehyde, which is subsequently reduced to form ethyl alcohol.

The reactions of glycolysis are also important as the initial steps in aerobic respiration. In respiration the final product of the glycolytic pathway is pyruvic acid, which is then introduced into the citric acid cycle, where it is further degraded (with the stepwise release of large

quantities of energy) to carbon dioxide and water.

Energy obtained by the cells for growth and multiplicaton from the orderly breakdown of organic compounds, entails a series of oxidation and reduction reactions. The biological oxidation of organic compounds involves the removal of two hydrogen atoms; this reaction is called *dehydrogenation.* The reduction of such compounds involves the addition of two hydrogen atoms to an organic molecule; this reaction is called *hydrogenation*. The compound that loses the hydrogen atoms is called the *hydrogen donor;* the compound that accepts hydrogen is called the *hydrogen acceptor.* Enzymes that catalyze the oxidation of organic compounds by the removal of hydrogen atoms are called *dehydrogenases.* Associated with these enzymes are two organic molecules that serve as temporary hydrogen acceptors; these molecules, which act as coenzymes (q.v.), belong to the class of organic molecules known as pyridine nucleotides and are called diphosphopyridine nucleotide (DPN) and triphosphopyridine nucleotide (TPN).

In the fermentation of glucose to carbon dioxide and ethyl alcohol a total of 56 kilocalories of energy per mole of glucose is released. However, the simple release of this energy would be of no use to the cell, since the energy would all be in the form of heat, and no energy would be available for use in the biosynthesis of cell constituents.

Fermentation does not yield much energy. In energy-yielding metabolism the energy that is released is stored for future use in the high-energy chemical bonds of a compound known as adenosine triphosphate (ATP). In living cells the energy released from breaking the pyrophosphate bonds of ATP is used to drive the various energy-requiring biosynthetic reactions necessary for cell growth and multiplication.

27. Ask questions of different kinds on the text.

28. Write an abstract of the text with key and connective words and learn it by heart.

29. Find in the text the following word combinations and translate them into Ukrainian.

almost quantitatively, the same compounds yield, to a noteworthy degree, by enzymatic action, the time periods involved, appears to proceed, no allowance is made for, the quantity of, capable of action, outside the latter, in part assumed, to exclude surface phenomena, temporary hydrogen acceptors, act as coenzymes (q.v.), energy is released, provide with nutrients, contains immobile reserves, to convert these into soluble metabolites, the juices emptying into, the alimentary tract.

30. Find the English equivalents of the following Ukrainian word combinations.

перетворюватися на, проходити через, виробляти метиловий спирт, в великій кількості, траплятися за більш сприятливих умов, середня кількість протеїну, середня швидкість реакції, може бути визначена як, брати до уваги, служить як, виробляється живими тканинами, виконують фізиологічну функцію, біохімічний шлях, розкладається на, відновлена до молочної кислоти, втрачати карбон диоксид, входити до циклу, отримана енергія, викликати серію окислювальних реакцій.

31. Fill in the gaps.

enzyme, lose, multicellular, entails, reduce, break down, respiration, compound, occur, pathway, involve, release, energy-yielding.

The ____ or the "ferments" are named by adding the suffix "ase" to the stem of the name of the substrate. Fermentation is an _____metabolic process that ____ the decomposition of carbohydrates in the absence of oxygen. Fermentation ____in many microorganisms and in some types of cells in ____ plants and animals. The end product of fermentation may be

an alcohol or an organic. The biochemical ____ of fermentation is known as glycolysis. In the course of this series of reactions glucose is ____ to two molecules of pyruvic acid, a 3-carbon____ . The pyruvic acid then may be ____ to form lactic acid, or it may ____carbon dioxide to form acetaldehyde. The reactions of glycolysis are also important as the initial steps in aerobic ____ . Pyruvic acid is further degraded (with the stepwise ____ of large quantities of energy) to carbon dioxide and water. Energy obtained by the cells for growth and multiplicaton ____ a series of oxidation and reduction reactions.

32. Match the synonyms.

include, happen, join, liberate, carry out, breathing, receive, split, create, disintegrate, occur, respiration, obtain, break down, fall into, add, involve, release, drive, form.

33. Supply the notions for the following definitions.

small living beings, taking in air, getting bigger, matter components, opposite to presence.

34. Prepare the text for the back translation.

35. Use the gerundial complexes as well as the argumentation and connection words in the dialogues on the topics

1. Fermentation as a metabolic process. 2. Types of metabolic reactions. 3. Enzymes and coenzymes.

36. Translate the following abstract into English.

Діяння ферментів починається з утворення ферментно-субстратного комплексу, який є нестабільним і після перебігу ферментативної реакції розпадається з утворенням продукту та вільного фермента. З субстратом з'єднується не вся молекула фермента, а окрема її ділянка

– активний центр, до якого субстрат має специфічну спорідненість – комплементарність. Специфічне зв'язування субстрату зумовлене наявністю в активному центрі ферментів хімічних груп, здатних утворювати водневі іонні та гідрофобні зв'язки з відповідними хімічними групами субстрату. Спорідненість ферментів до субстрату характеризується субстратною константою. Після утворення ферментно-субстратного комплексу починається безпосередньо хімічна реакція між ферментами і субстратом, яка відбувається в так званому каталітичному центрі ферментів Для ферментів характерна різна швидкість перебігу реакцій, що вони каталізують; яка залежить від: а) концентрації ферментів; б) концентрації субстрату; залежність швидкості ферментативного процесу від концентрації субстрату характеризується *константою Міхаеліса;* в) концентрації водневих іонів (pH) середовища; існують оптимальні значення pH для дії кожного фермента; г) температури середовища; д) наявності активаторів або *інгібіторів.*

Сировиною для експериментального та промислового одержання ферментів є головним чином біологічний матеріал – мікроорганізми, тканини рослин і тварин. Процес одержання складається з таких стадій: 1) екстрагування ферментів з біологічного матеріалу; 2) фракціювання екстракту і видалення баластних білків; 3) тонка очистка фермента і, якщо можливо, його кристалізація.

LESSON 13

Verbals Reviev

The Conditional Mood

Part I

1. Read and memorize the following words and word combinations.

energy-yielding	що виробляє енергію
decomposition,	
break down	розпад
multicellular	багатоклітинний
lose	втрачати
respiration	дихання
equilibrium	рівновага
rennet	сичуг
pick up	захоплювати
manufacture	виробляти
butterfat	масляний жир
cheese	сир
preserve	зберігати
cause sour	зкислювати
curd	творог
refine	очищувати
lactic acid	молочна кислота
churning	визрівання сиру

2. Find the international words in the text and give their Ukrainian analogues.

3. Translate the affixed words into English.

розкладення, виділення, перетворення, проміжний, окислювати,

окислення, відкривати, переамінуваня, очікувати, приймати, засвоєння, випереджуючий (запобігаючий), відділення, включати, внутрішньості, міжмолекулярний.

4. Discuss the title of the following text. Look throug the text and give a title to each paragraph.

5. Look through the text for information. Read and translate the text.

The Mechanism of Alcoholic Fermentation

Alcoholic fermentation may be defined as the enzymatic conversion of carbohydrate into ethanol and carbon dioxide with small amounts of erol and traces of other products. In alcoholic fermentation, pyruvic acid is decarboxylated to yield carbon dioxide and acetaldehyde; the acetaldehyde acts as the final hydrogen acceptor and is converted to ethyl alcohol.

It should be pointed out that that applies in a practical sense to the conversion of starches (after saccharification) or sugars into alcohol and carbon dioxide by *Saccharomyces nae,* commonly known as yeast. Alcoholic fermentation can be broughtt about, however, by microorganisms other than *Saccharomyces cerevisiae.* These include other species of yeasts and certain genera of bacteria and fungi; in fact, a great many species of microorganisms form substantial quantities of ethanol along with large quantities of other products. Thus such an organism as *Escherichia coli,* commonly found in the intestines of animals, while forming lactic acid, acetic acid, formic acid, dioxide, and hydrogen from glucose, also forms ethanol in relatively large quantities. However, *Sarcina ventriculi,* a species of bacteria, has a metabolism much like that of *Saccharomyces cerevisiae;* it converts glucose into ethanol and carbon dioxide with yields comarable to those of yeast. Certain fungi, *e.g.,* species of *Fusarium,* also produce large yields of ethanol and carbon dioxide, and may be considered to possess an alcoholic

type of fermentation.

The basic mechanism of alcoholic fermentation is basically similar as that which underlies an anaerobic cellular metabolism in green plants, animals, bacteria, yeasts, and fungı, and that this similarity occurs between cells of different tissues of the same organism, *e.g.,* brain, liver, muscle. This relationship would imply that Nature in her evolution has followed a basic pattern, to deviate only in its fundamental behavior from species to species. Thus the final products of the dissimilation of *Saccharomyces cerevisiae* are mainly ethanol and carbon dioxide; of *Aerobader aerogenes,* acetic, formic, lactic, and succinic acid:, 2,3-butylene glycol, acetylmethylcarbinol, ethanol, carbon dioxide, and hydrogen; of the propionic acid bacteria, propionic, succinic, and acetic acids, and carbon dioxide.

The mechanisms of anaerobic dissimilation in the three species of microorganisms are, however, fundamentally alike; only the terminal train formations are different. This concept may be illustrated by the common conversion of carbohydrate to the pyruvatc lactate equilibrium. Beyond this point the dissimilation varies within species, and within the species with the environment. Pyruvate may be considered to be the cardinal intermediate of metabolism in that it terminates the common phase and initiates terminal phases of anaerobic dissimilation, which vary with species and environment. Moreover, pyruvat undergoes transamination with the formation of amino acids; it is the product oxidized by oxygen in respiration through the Kreb's cycle and the cytochrome oxidase system; and it may also lead to fat formation. Pyruvate thus appears to be a junctionpoint of the various phases of basic metabolism.

Alcoholic fermentation is refered to as an anaerobic metabolism, any process brought about by microorganisms or enzymes.

The classical investigations of Pasteur, which culminated in ac-

ceptance of the principle that fermentation is caused by a living cell, began in 1857 with his studies on yeast. He discovered the existence of organisms which do not require atmospheric oxygen and referred to the phenomenon by his famous statement, *"La fermentation est la vie sans air."* Pasteur considered such a process as an intramolecular oxidation in which part of the glucose is oxidized, whereas another part is reduced.

The production of the ethanol and carbon dioxide is anaerobic and requires no anticipation of atmospheric oxygen. Yeast does possess the aerobic respiratory mechanism, and, when grown in the presence of air, as in the industrial production of yeast cells, uses its aerobic system to build cell otoplasm but little alcohol.

The basic scheme of alcoholic fermentation generally accepted at the present time is referred to as the Embden – Meyerhof scheme. Glycolysis is the process by which carbohydrates including glycogen, glucose, levulose, or mannose are metabolized to pyruvic acid (or lactic acid).

6. Say whether the following statements are true or false and give your proofs why.

1. In alcoholic fermentation, pyruvic acid is carboxylated to yield carbon dioxide and acetaldehyde. 2. The acetaldehyde acts as the first hydrogen acceptor and is converted to ethyl alcohol. 3. Alcoholic fermentation can be broughtt about only by *Saccharomyces cerevisiae.* 4. Alcoholic fermentation is refered to as an aerobic metabolism. 5. Glycolysis is the process by which carbohydrates including glycogen, glucose, levulose, or mannose are metabolized to citric acid.

7. Ask questions of different kinds on the text.

8. Write the plan of the text.

9. Write an abstract of the text with the key words and learn it by heart.

10. Find in the text the following word combinations and translate them into Ukrainian.

may be defined as, to yield carbon dioxide, the final hydrogen acceptor, applies to, in a practical sense, can be brought about, a great many species, substantial / large quantities, comparable to, may be considered to possess, along with, commonly found in the intestine, relationship would imply, to deviate in behavior, the cardinal intermediate, fundamentally alike, the terminal train formations, the common conversion to, beyond this point, the dissimilation varies within species, with the environment.

11. Find the English equivalents of the following Ukrainian word combinations.

алкогольна ферментація, ферментне перетворення, невелика / значна кількість, молочна кислота, діяти як, слідувати основній моделі, слід відмітити, звичайно відомий як, порівняно з, схожість між, дуже схожій на, інший ніж, види дріжджів, певнне покоління бактерій, утворювати етанол, звичайно знаходиться у, мурав'їна кислота, перетворювати на, вести до утворення, як вважається, прийняти назва, певні грибки, оцтова кислота.

12. Fill in the gaps.

amounts, forms, genera, yield, tissues, comarable, occurs, acts, quantities, applies, starches, yeasts, conversion, defined, acceptor.

Alcoholic fermentation may be ____ as the enzymatic ____ of carbohydrate into ethanol and carbon dioxide with small ____ of erol and traces of other products. In alcoholic fermentation, pyruvic acid is decarboxylated to ____ carbon dioxide and acetaldehyde; the acetaldehyde ____ as the final hydrogen ____ and is converted to ethyl alcohol. It should be pointed out that that ____ in a practical sense to the conversion of ____ (after saccharification) or sugars into alcohol and carbon dioxide by yeast. These include other species of ____ and certain ____ of bacteria

and fungi. Thus such an organism as *Escherichia coli,* ____ ethanol in relatively large ____. *Sarcina ventriculi* converts glucose into ethanol and carbon dioxide with yields ____ to those of yeast. This similarity ____ between cells of different ____ of the same organism, *e.g.,* brain, liver, muscle.

13. Match the synonyms.

be, mark, sentence, determine, breath, excrete, research, recognize, alike, need, exist, decide, dissimilate, investigate, match, similar, necessity, respirate, point out, statement.

14. Learn the derivatives and use them in situations.

aerobic – anaerobic, alcali – alcaline – alcohol – alcoholic – alcoholism, glycolysis – glycogen – glucose – glucoside – glucan – gliceride – glicerol – glicogene – glicol, assimilate – assimilation – dissimilate.

15. Find the words to match the definitions.

basic scheme of alcoholic fermentation, the final hydrogen acceptor, *Saccharomyces nae,* final products of the dissimilation of *Saccharomyces cerevisiae*, product of alcohol industry, fermenting matter, the process by which carbohydrates are metabolized to pyruvic acid, experimental studies.

16. Give the definitions to the following notions.

alcoholic fermentation, transamination, metabolism, dissimilation, environment, statch, sugar, bacteria, intermediate, intamolecular, fungi.

17. Prepare the text for the back translation.

18. Use the infinitive or the gerund or both after the verbs below in the dialogue.

Model. Do you suggest to carry out research? – I suggest carrying out

the research.

order, require, approve of, insist on, support, demand, need, want, begin, continue, stop, remember, forget, keep, propose, deny, advise, allow, like, enjoy, hate, try, afford, hope, agree, attempt, choose, dare, help, learn, refuse, promise, prefer.

19. Analyze tense and voice of the verbs in the text. Use them in the sentences. Pay special attention to the modal verbs.

B_{12},

20. Compare the sentences below and use them in dialogues to express desirability as:

1) Real condition.

1. If you do this, I'll do that. 2. If she doesn't do this, he'll do that. 3. Unless she does this, he'll do that.

2) Half-real condition in future.

If you did this, I would do that. 2. If you didn't do this, I wouldn't do that. 3. Unless you did this, I wouldn't do that. 4. I wish I could do it / didn't do that. 5. I ‘d like to do that.

3) Unreal condition in the past.

I would / wouldn't have done this if you hadn’t done that. 2. I could have done it if you hadn’t.

21. Fill in the gaps with conjunctions.

Thus ____ an organism as *Escherichia coli,* commonly found in the intestines of animals, while forming lactic acid, acetic acid, formic acid, dioxide, and hydrogen from glucose, ____ forms ethanol in relatively large quantities. ____ , *Sarcina ventriculi,* a species of bacteria, has a metabolism much like that of *Saccharomyces cerevisiae.* Pyruvate may be considered to be the cardinal intermediate of metabolism. ____ , pyruvat undergoes transamination with the formation of amino acids. ____ it may ____ lead to fat formation. Pyruvate ____ appears to be a junction point of the

various phases of basic metabolism. Alcoholic fermentation is refered to ____ an anaerobic metabolism. Pasteur discovered the existence of organisms ____ do not require atmospheric oxygen. Yeast , when grown in the presence of air, ____ in the industrial production of yeast cells, uses its aerobic system to build cell otoplasm ____ little alcohol. The basic scheme of alcoholic fermentation is referred to ____ the Embden – Meyerhof scheme. Glycolysis is the process by ____ carbohydrates including glycogen, glucose, levulose, or mannose are metabolized to pyruvic acid (or lactic acid).

22. Discuss the problems using the participle, the infinitive, the Gerund as well as the argumentation and connective words.

1. The essence of alcoholic and lactic fermentation. 2. The microorganisms causing alcoholic and lactic fermantation. 3. The application of alcoholic and lactic fermentation.

I would like Why should I? I should say, It should be pointed out that

owing to / due to /thanks to, pay one's due, to be due to smb, in due time, with due reference, according to

I am especially grateful to, allow me to express my gratitude to

23. Translathe the abstract into English.

Форми бродінь, відкриті К. Нейбергом. *Першою формою бродіння* є нормальне дріжджове бродіння.

Основними продуцентами етанолу є дріжджі *Saccharomyces cerevisiae* та бактерії *(Zymomonas mobilis, Leuconostoc mesenteroides, Sarcina ventriculi.* Катаболізм глюкози у процесі зброджування її до етанолу та CO_2 здійснюється гліколітичним шляхом. Глюкоза окиснюється до пірувату. Перетворення пірувату на етанол проходить у два етапи. 1) піруват декарбоксилюється *піруватдекарбоксилазою* до ацетальдегіду; 2) ацетальдегід відновлюється *алкогольдегідрогеназою* до етанолу за участю НАДН. При цьому переноситься водень, який

утворився під час дегідрування триозофосфату. Окисно-відновний баланс, таким чином, зберігається.

Якщо до дріжджів, які зброджують глюкозу, добавити бісульфіт (він є нетоксичним для дріжджів), бікарбонат натрію або двозаміщений фосфорнокислий натрій, то з'явиться новий продукт – гліцерин і одночасно знизиться вихід етанолу та CO_2. Це *друга та третя форма бродіння за Нейбергом.*

Відомий для дріжджів шлях утворення етанолу виявлений тільки у бактерії *Sarcina ventriculil.* У процесі бродінь, що здійснюються деякими видами ентеробактерій і клостридіями, етанол є побічним продуктом. Попередник етанолу – ацетальдегід – утворюється у цьому разі не з піровату, а шляхом відновлення ацетил-КоА. Оцтовий альдегід взаємодіє з НАД-H_2 і відновлюється до етилового спирту, а НАД-H_2 окислюється у НАД. Ця реакція каталізується ферментом алкогольдегідрогеназою.

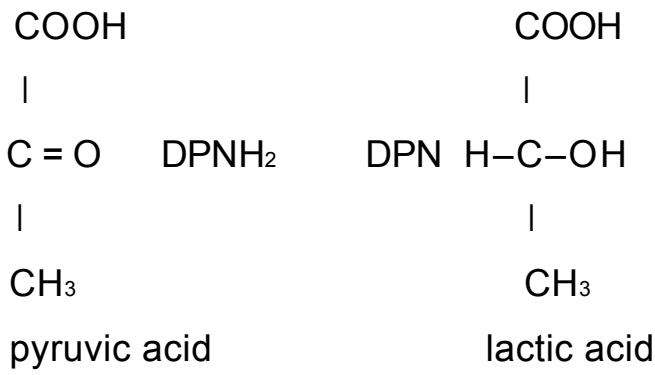
У процесі спиртового бродіння утворюється чотири молекули АТФ, дві з яких витрачаються на фосфорилювання гексози. Таким чином, запасаються дві молекули АТФ. В цьому полягає біологічний сенс бродіння. Більшість дріжджів зброджують моносахариди і дисахариди. На развиток дріжджів і перебіг бродіння впливає концентрація цукру; кислотність субстрату, який зброджується; температура, вміст спирту.

Part II

24. Read and sum up the text.

Fermentation In Diary Industry

Lactic fermentation takes place in fermented milk products. During the course of glycolysis four hydrogen atoms are released, and these atoms are temporarily picked up by DPN to form two molecules of DPN.



pyruvic acid lactic acid

In the manufacture of cheese and butter the lactic acid bacteria *Aspergillus niger* and *Micrococcus lysodeikticus* are used to ferment the milk sugar lactose to lactic acid. In lactic fermentation the pyruvic acid acts as the final hydrogen acceptor, resulting in the formation of lactic acid. The lactic acid causes the milk to sour, but it also acts as a preservative. Coagulation of milk proteins produces a solid material called *curd.*

The refining of the curd is brought about by the further action of the lactic acid bacteria or by other bacteria or fungi. In the manufacture of Swiss cheese, for example, a subsequent fermentation by the propionic acid bacteria produces both propionic acid and carbon dioxide. The propionic acid gives Swiss cheese its characteristic flavor, while the carbon dioxide is responsible for the large holes.

In the manufacture of butter, the souring of cream by lactic acid is followed by the separation of butterfat in the churning process. Some of the lactic acid bacteria also ferment citrate and acetoin. This compound is spontaneously oxidized to diacetyl to give butter its characteristic flavor and aroma.

25. Ask questions of different kinds on the text.

26. Write an abstract of the text with the key and connective words. Learn your abstract by heart.

27. Find in the text the following word combinations and

translate them into Ukrainian.

fermented milk products, picked up by pyruvic acid, the lactic acid bacteria are used, the final hydrogen acceptor, resulting in the formation of, acts as a preservative, coagulation of milk proteins, called *curd,* the refining of the curd, brought about by, the further action, the manufacture of Swiss cheese, a subsequent fermentation by bacteria, is responsible for the large holes, the souring of cream, is followed by, this compound is oxidized to.

28. Find the English equivalents of the following Ukrainian word combinations.

молочна ферментація має місце, протягом гліколізу, атоми вивільняються, утворюється молочна кислота, виробництво сиру та масла, використовуються бактерії, сполука окислюється до, піруватна кислота діє як, утворює твердий матеріал, призводить до, спричиняє згортання молока, очищення сиру, надає характерного смаку та аромату, відділення масляного жиру, процес визрівання.

29. Explain the topic and the aim of the text.

30. Fill in the gaps.

sour, acceptor, churning, refining, lactic, flavor, curd, souring, manufacture, course, acid, released

____ fermentation takes place in fermented milk products. During the ____ of glycolysis four hydrogen atoms are ____ , In lactic fermentation the pyruvic acid acts as the final hydrogen ____ , resulting in the formation of lactic acid. In the ____ of cheese and butter the lactic____ bacteria *Aspergillus niger* and *Micrococcus lysodeikticus* are used. The lactic acid causes the milk to ____ but it also acts as a preservative. Coagulation of milk proteins produces a solid material called ____. The ____ of the curd is brought about by the further action of the lactic acid bacteria or by other bacteria or fungi. The propionic acid

gives Swiss cheese its characteristic ____, while the carbon dioxide is responsible for the large holes. In the manufacture of butter, the ____ of cream by lactic acid is followed by the separation of butterfat in the ____ process. Some of the lactic acid bacteria also ferment citrate and acetoin.

31. Find synonyms of the following words in the text.

production, taste, turn in, turn to, cause, ripening, protector, following, apply, acidic.

32. Supply the notions for the following definitions.

opposite to sweet, milk industry, product of milk coagulation, product of milk fermenting, milk fat product.

33. Prepare the text for the back translation.

34. Discuss the situations using the Participle, the Infinitive, the Gerunds well as the connective and argumentation words.

1. The essence of alcoholic and lactic fermentation. 2. The microorganisms causing alcoholic and lactic fermantation. 3. The application of alcoholic and lactic fermentation.

35. Translate the following abstract into English.

Молочнокислі бактерії об'єднують у родину *Lactobacillaceae*. Вирощують молочнокислі бактерії переважно на складних середовищах, що містять достатньо високі концентрації дріжджового автолізату, томатного соку, молочної сироватки і навіть крові. Вони можуть використовувати молочний цукор (лактозу). Лактоза являє собою дисахарид, який перш ніж катаболізуватися, повинен бути розщеплений на глюкозу та галактозу (фермент *Р-галактозидаза).*

Відомі три типи молочнокислого бродіння: гомоферментативне молочнокисле бродіння здійснюють бактерії родів *Streptococcus,*

Pediococcus, Aerococcus, Lactobacillus, які утворюють з глюкози тільки одну молочну кислоту. Глюкоза катаболізується гліколітичним шляхом. Водень, який відщеплюється під час дегідрування гліцеральдегід-3-фосфату у вигляді НАДН, передається на піруват. У присутності *лактатдегідрогенази* піруват відновлюється до лактату. Лише невелика частина пірувату декарбоксилюється та перетворюється на оцтову кислоту, етанол і CO_2, а також ацетоїн.

Гетероферментативні молочнокислі бактерії *Leuconostos mesent-roides* утворюють етанол. Глюкоза розкладається пентозофосфатним шляхом до пентозо-фосфату. Ксилулозо-5-фосфат за участю *фосфокетолази* перетворюється на ацетилфосфат і гліцеральдегід-3-фосфат: Ацетилфосфат відновлюється *ацетальдегіддегідрогеназою* та *алкогольдегідрогеназою* до етанолу. Інший продукт розщеплення глюкози – гліцеральдегід - 3 - фосфат – відновлюється до лактату через піруват.

Біфідобакткрії утворюють з глюкози оцтову і молочну кислоти.

Промислове значення мають наступні види: Streptococcus *lactis* (молочнокислий стрептокок) , *S. cremoris* (вершковий стрептокок), *S. diacetilactis,* якій використовують при виробництві кисломолочних продуктів, масла і сирів.

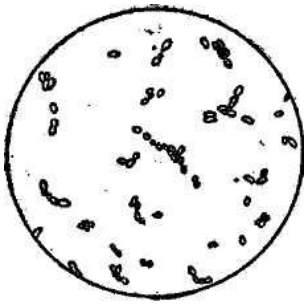


Figure7.
Streptococcus lactis

Figure 8.
Lactobacillus acidofilus

Lesson 14

The Conditional Mood.

Part I

1. Read and memorize the following words and word combinations.

baker's yeast, leaven	пекарські дріжджі
grain extract	екстракт зерна
bottom-fermenting	нижнє бродіння
malt	солод
hops	хміль
grape juice	виноградний сік
nutritional purposes	потреби харчування
pure stock culture	чиста вихідна культура
intermediate stage	проміжна стадія
scale up the inoculum	прискорити щеплення
excess	надлишок
consume	споживати
broth	бульон
dilution	розбавлення
shelf life	строк зберігання
supplement	добавка
beverage	напій
confectionary	кулінарія
key requirement	головна вимога
iron starvation	нестача заліза
chelator scavenge	хелатне масло
stainless steel	неіржавіюча сталь
glass lined	обкладене склом
molasses	меляса

2. Translate the following words into English.

бактерія, бактерійний, природа, природний, бактеріолог, бактеріофаг, центрифуга, центрифугувати, центрифугування, центрифужний, центрифугований, перецентрифугувати, продукт, продукувати, продуцент, культура, аерація, фосфор, фосфорний, аміак, нітроген, сульфат, результат, змішувати, змішування, емульсія, емульгуючий, агент, консистенція, зпресований, проміжний, щеплення (введення), відновлювати, склад, добавка, збільшувати, зменшувати.

3. Make up the complex words.

single, cell; carbon, hydrate; bottom, ferment; top, ferment; heat, kill; sulfur, contain.

4. Scan the text for the grounds of yeasts classification. Read and translate the text.

Yeast Cell Production

Yeast is a rich source of protein, amino acids, carbohydrates, minerals, fat, the B-complex vitamins, vitamin D_2. The chemical composition of yeasts varies with the species and growing medium.

Yeasts grown for bread making, food, feed, and medicinal purposes are the primary product of the fermentation process and produce little alcohol. The spent medium is the byproduct and is discarded after centrifuging out the yeast cells. Yeasts grown during fermentations for beer, ale, spirits, wine, and industrial alcohol, however, are the byproducts, while the spent medium becomes the final consumer product.

Types. *Baker's yeast* is a strain of S. *cerevisiae* grown on a medium of molasses and ammonia or molasses and grain extracts. The yeast rapidly ferments the sugars derived from the starch in the flour to produce carbon dioxide gas which leavens the dough.

Brewer's yeasts are strains of S. *cerevisiae* that slowly ferment

the extract of malt, cereals, and hops to produce beer (bottom-fermenting yeast) or ale (top-fermenting yeast). After separation from the spent medium, these yeasts are dried for animal feed or refined before drying for use in food and medicine.

Spirits and industrial alcohol yeasts are strains of S. *cerevisiae,* and sometimes other species, that ferment molasses, grains, or other sugary material. After separation from the spent medium, yeast and fermentation residues are dried together for animal feed.

Wine yeasts are strains of *S. cerevisiae,* var. *ellipsoideus,* the species that ferment grape juice. Here the yield of yeast is too small to be salvaged economically.

For *Food (and feed) yeast* production, strains of S. *cerevisiae* and *Candida utilis* are cultivated. *C. utilis* is better able to utilize sugars from waste sulphite liquor from wood pulp manufacture.

Yeast for baking or nutritional purposes is cultured in large aerated fermentors in a medium containing molasses as a major ingredient. Molasses contains large amounts of sugar as the source of carbon and energy, and also contains minerals, vitamins, and amino acids used by the yeast. To make a complete medium for yeast growth, phosphoric acid (a phosphorus source) and ammonium sulfate (a source of nitrogen and sulfur) are added.

Beginning with the pure stock culture, several intermediate stages are needed to scale up the inoculum to a size sufficient to inoculate the final stage. It is undesirable to add all the molasses to the fermentor at once because this results in a sugar excess. The yeast then ferments much of the sugar to alcohol plus CO_2 rather than turning it into yeast cells. Then as the yeast culture grows and consumes this sugar, more molasses is added in controlled "feedings."

At the end of the growth period, the yeast cells are recovered from the broth by centrifugation. The cells are then washed by dilution with water and

recentrifuged until they are light in color. Baker's yeast is marketed in two ways, either as compressed cakes or as a dry powder. *Compressed yeast cakes* are made by mixing the centrifuged yeast with emulsifying agents, starch, and other additives that give it a suitable consistency and reasonable shelf life, and the product is then formed into cubes or blocks. A compressed yeast cake contains about 70% moisture and thus must be stored in the refrigerator so its activity is maintained.

5. Say whether the following statements are true or false and you're your proofs why.

1. Yeasts grown for bread making, food, feed, and medicinal purposes produce much alcohol. Yeast is a poor source of protein. 2. Baker's yeast is a strain of S. *cerevisiae* grown on a medium of tissue broth. 3. It is desirable to add all the molasses to the fermentor at once. 4. The yeast is turning much of the sugar into yeast cells. 5.The cells are washed by dilution with water and recentrifuged until they are moist. 6. Baker's yeast is marketed in liquid form. *Compressed yeast cakes* are made pure. 7. *Nutritional yeast,* marketed as a food supplement, is frozen. 8. Yeast is added to wheat or corn flour to increase the nutritional value of these foods .

6. Ask questions of different types on the text.

7. Prepare the text abstract and essay and learn them by heart.

8. Find in the text the following word combinations and translate them into Ukrainian.

grown for bread making, primary products, grain extracts, brewer's bottom-fermenting yeast, a second species added, for nutritional purposes, aerated fermentor, large amounts of sugar, results in a sugar excess, in controlled feedings, either as compressed cakes or dry powder, suitable consistency, reasonable shelf life, stored in the refrigerator,

activity is maintained, marketed as a food supplement, rich in B vitamins, except for amino acids, to increase the nutritional value, sold in pelleted form, health food, active dry yeast, until their moisture is reduced, exhibit a leavening action.

9. Find the English equivalents of the following Ukrainian word combinations.

багаті джерела, штам S. *cerevisiae,* вирощені на середовищі, верхнє бродіння, нижнє бродіння, сухі медицинські дріжжі, пекарські дріжджі, пивні дріжджі, потреби харчування, аераційний ферментатор, чиста культура, декілька проміжних стадій, прискорити інокуляцію, до потрібного розміру, надлишок цукру, споживати цукор, контрольовані порції, відновлювати з бульону, промивати розведенням, емульгуючий засіб, піднімати тісто.

10. Fill in the gaps.

malt, stock, added, dried, medium, strain, purposes, bottom, source.

Yeasts grown for bread making, food, feed, and medicinal ____ are the primary products of the fermentation process and produce little alcohol.Yeast is a rich ____ of protein, amino acids, carbohydrates, minerals, fat, the B-complex vitamins, vitamin D_2. Baker's yeast is a ____ of S. *cerevisiae* grown on a ____ of molasses and ammonia or molasses and grain extracts. *Brewer's yeasts* are strains of S. *cerevisiae* that slowly ferment the extract of ____, cereals, and hops to produce beer (____-fermenting yeast) or ale (top-fermenting yeast. ____medical yeast, *Medicinal Cerevisiae has* a second species, strains of C. *utilis,* added.To make a complete medium for yeast growth, phosphoric acid (a phosphorus source) and ammonium sulfate (a source of nitrogen and sulfur) are ____. Beginning with the pure ____ culture, several

intermediate stages are needed to scale up the inoculum to a size sufficient to inoculate the final stage.

11. Match the synonyms.

aim, earth, quantity, comprise, sell, enhance, extra, supplement, shape, component, genera, task (goal), additive, ground, form, stimulate, kind, part, purchase.

12. Match the antonyms.

color, round, lose, remove, suffucient, poor, much, suitable, little, usual,decrease, dry, inhibit, desirable, rich, unsuitable, moist, increase, find, unusual, square, undesired, insufficient, colorless, add, insert, enhance.

13. Learn the derivatives and use them in situations.

nutrient – nutrition – nutritional – nutritionally, emulsion – emulsify – emulsified – emulsification, alcali – alcalic – alcaloid – alcoholic – alcoholism.

14. Define the notions.

byproduct, discarded, supplement, recentrifuged, medium, nutritional, mixture, emulsuion, baker's yeast, bottom-fermenting yeast, top-fermenting yeast, *Brewer's yeast*, *Wine yeasts*, dried medical yeast, S. *cerevisia*, molasses, recover, stock culture, *Compressed yeast cake*, *Nutritional yeast*, *active dry yeast*, dillution, alcohol, consumer product.

15. Supply the notions for the following definitions.

medicinal purposes, what bread is made of, sugary material, medium major ingredient in producing yeast for baking or nutritional purposes, phosphorus source, a source of nitrogen and sulfur, shelf life, heat-procecced.

16. Prepare the text for the back translation.

17. Analyze tense and voice of the verbs in the text. Use them in the sentences.

18. Make up word combinations.

Model 1. noun + noun.

grain, bacteria, juice, medium, period, soil, shelf, carbon, sugar, alcohol, culture, grape, extract, excess, stock, life, production, growth, molasses, source.

Model 2. adjective + noun.

plant, yeast, purposes, primary, major, amount, nutritional, medicinal, dry, fermentor, growing, ingredient, product, state, large, medium, aerated, dried, value, single-celled.

19. Compare the sentences below and use them to express

1) preferences

I prefer this./ I'd prefer to do that.

Which do you prefer?/ Which would you prefer to do?

I don't like either one of them.

I'd rather do this./ I'd rather not do this. / I'd much rather do that. / I would sooner do that.

Which would you rather do?

There isn't much choice.

I can't make up my mind.

2) advisability

You should / need / ought to / had better / had better not do that.

They ought to do this. / They shouldn't do that. What should they do?

3) regret and opinions about the past

My / only / biggest regret is / It's too bad that / I wish they had / hadn't done this. If I had done this, that would have (not) happened.

20. Form the infinitival, gerundial or participial complexes from

the subbordinate clauses.

1. The acetaldehyde acts as the final hydrogen acceptor and is converted to ethyl alcohol. 2. However, *Sarcina ventriculi* entry has a metabolism much like that of *Saccharomyces cerevisiae;* it converts glucose into ethanol and carbon dioxide. 3. The basic mechanism of alcoholic fermentation is basically similar to that in green plants, animals, bacteria, yeasts, and fungı, and it similarity occurs between cells of different tissues of the same organism. 4. The mechanisms of anaerobic dissimilation in the three species of microorganisms are, however, fundamentally alike; only the terminal train formations are different. 5. Pyruvate initiates terminal phases of anaerobic dissimilation, which vary with species and environment. 6.The classical investigations of Pasteur, which culminated in acceptance of the principle that fermentation is caused by a living cell, began in 1857 with his studies on yeast. 7. He discovered the existence of organisms which do not require atmospheric oxygen. 8. In intramolecular oxidation part of the glucose is oxidized, whereas another part is reduced. 9. Glycolysis is the process by which carbohydrates are metabolized to pyruvic acid (or lactic acid).

21. Discuss the situations using the Conditional Mood of the verb and connective words.

1.The origin and sources of yeast. 2. Kinds of yeast and spheres of their application. 3. Stages to scale up the inoculum. 4. Methods of obtaintng dry baker's yeast.

suppose / let's imagine. I guess

give / apply every effort to, try (hard)

The idea proved true / false.

to be sufficiently / unsufficiently / enough developed

to give sufficient proof

doubtless, without any doubt, undoubtedly so, put to doubt, It's doubtful / dubious. There is no doubt about it.

It’s quite probable / possible, absolutely improbable / impossible, in every / all probability / evidence It’s quite natural / unnatural. Naturally.

22. Translate the abstract into English.

У зв'язку зі здатністю дріжджів викликати *спиртове бродіння* їх використовують у хлібопеченні, виноробстві, пивоварінні, спиртовому й гліцериновому виробництві, молочній промисловості тощо, їх широко застосовують для одержання кормового й харчового білка, а також амінокислот, вітамінів (групи В, *О,* каротиноїдів та ін.), полісахаридів, ліпідів, ферментів тощо. Патогенні форми дріжджів спричиняють захворювання людини і тварин — кандидамікози, бластомікози тощо. Вирощують дріжджі на відходах деревини, качанах кукурудзи, луз зі соняшнику, соломі, комиші та відходах целюлозно-паперової й спиртової промисловості. Випускають дріжджовий концентрат пресованим або сухим.

Виробництво *пекарських дріжджів* роду *Saccharomyces* грунтується на вирощуванні їх у водному розчині *меляси.* В процесі такого виробництві мелясу розбавляють чистою водою (у співвідношенні 1:1), розчин дезинфікують хлорним вапном і підкислюють сірчаною ккислотою, після чого в нього додають живильні фосфорні й азотисті солі. Далі розчин нагрівають до температури 100°С, витримують протягом 1 год, охолоджують і фільтрують або прояснюють за допомогою центрифуг. Прояснений розчин меляси знову розбавляють чистою водою (до концентрації сухих речовин 4–6%) і додають у нього для розмножування дріжджі з чистих культур. З одержаного таким способом розчину в дріжджо-ростильному апараті вирощують маточні й товарні дріжджі. В процесі вирощування в апарат подають стиснуте повітря (60–100 м / год на 1 м² рідини). Вирощені дріжджі виділяють за допомогою *сепараторів,* волога видаляється фільтр-пресами, вакуум-фільтрами.

Part II

23. Read and sum up the text.

Vinegar Production

Vinegar is the product resulting from the conversion of alcohol to the key ingredient, *acetic acid,* by the acetic acid bacteria**.** Key genera of acetic acid bacteria include the *Acetobacter* and *Gluconobacter.* Vinegar can be produced from any substance that contains ethanol, although usual starting material is wine, beer, or alcoholic apple juice (hard cider). Vinegar can also be produced from a mixture of pure alcohol in water, in which case it is called *distilled vinegar,* the term *distilled* referring to the alcohol from which the product is made rather than the vinegar itself. Vinegar is used as a flavoring ingredient in is and other foods, and because of its acidity, it is also in pickling. Meats and vegetables properly pickled with vinegar can be stored unrefrigerated for years. The acetic acid bacteria are an interesting group of ukaryotes. These are strictly aerobic bacteria that differ from most other aerobes in that some of them, such as species of *Gluconobacter,* do not oxidize organic electron donors completely to CO_2 and water. Thus, when provided with ethyl as electron donor, they oxidize it via quinones into acetic acid, which accumulates in the medium. Acetic acid bacteria are quite acid tolerant and are not influenced by the acidity that they produce. There is a high demand during growth, and the main problem in the production of vinegar is to ensure sufficient aeration of the medium.

There are different processes for the production of vinegar. The *open-vat* process *(Orleans) method* which is original process, is still used in France where it was first developed. Wine is placed in shallow vats with considerable exposure to the air, and the acetic acid bacteria develop as a slimy layer on the top of the liquid. This process is not very efficient because the bacteria come in contact with both the air and the substrate only at the

surface.

The second process is the *trickle (Quick vinegar) method,* in which the contact between the bacteria, air, and substrate is increased by trickling the alcoholic liquid over beechwood twigs or wood shavings packed loosely in a vat or column while a stream of air enters at the bottom and passes upward. The bacteria grow on the surface of the wood shavings and thus are maximally exposed both to air and liquid. The vat is called a *vinegar generator*, and the juice is allowed to trickle through the wood shavings, and air is passed up through the shavings from the bottom. Acetic acid bacteria develop on the wood shavings and convert alcohol to acetic acid. The acetic acid solution accumulates in the collecting chamber and is recycled through the generator until the acetic acid content reaches at least 4%, the minimum for a product to be labeled as "vinegar." The life of the wood shavings in a vinegar generator is long, from 5 to 30 years, depending on the kind of alcoholic liquid used in the process.

Finally, the *bubble method* is basically a submerged fermentation such as is also largely applied in antibiotic production. With proper aeration, the efficiency of the bubble method is high, and 90-98% of the alcohol is converted to acetic acid.

Although acetic acid can be easily made chemically from alcohol, the microbial product, *vinegar,* is a distinctive material, the flavor being due in part to other substances present in the starting material and produced in the fermentation. For this reason, the microbial process, especially using the vinegar generator, has not been supplanted by a chemical process.

24. Ask questions of different kinds on the text.

25. Write an abstract of the text with key words. Learn your abstract by heart and retell it.

26. Find in the text the following word combinations and

translate them into Ukrainian.

resulting from, flavoring ingredient, quite acid tolerant, are not influenced by the acidity, high demand during growth, to ensure sufficient aeration of the medium, placed in shallow vats, with considerable exposure to the air, develop as a slimy layer, only at the surface, enters at the bottom, allowed to trickle through the wood shavings, the contact is increased, solution accumulates, collecting chamber, content reaches, labeled as "vinegar", submerged fermentation, distinctive material, supplanted by a chemical process.

27. Find the English equivalents of the following Ukrainian word combinations.

основна складова, оцтова кислота, вихідний матеріал, маринувати з уксусом, чистий алкоголь, містити етанол, забезпечувати етилом, зберігатися незамороженими, висока потреба, проходити через, повністю окислюватися, виробництво отцу, потік повітря, аерація середовища, субстрат збільшується, залежати від, на поверхні рідини, розчин кислоти, досягати 4%, бактерії розвиваються, перетворювати алкоголь на, бульбашковий метод.

28. Fill in the gaps.

acidity, vats, surface, shavings, medium, tolerant, bubble, exposure, flavoring, submerged, vinegar, trickling, influenced, solution, layer, ensure, stored, labeled, accumulate, provided.

____ is the product resulting from the conversion of alcohol to the key ingredient, *acetic acid,* by the acetic acid bacteria**.** Vinegar is used as a ____ ingredient in is and other foods, and because of its ____, it is also in pickling. Meats and vegetables properly pickled vinegar can be ____ unrefrigerated for years. Thus, when ____ with ethyl as electron donor, they oxidize it via quinones into acetic acid, which ____ in the medium. Acetic acid bacteria are quite acid ____ and are not ____ by the acidity

that they produce. There is a high demand during growth, and the main problem in the production of vinegar is to ____ sufficient aeration of the ____. In the *open-vat* process *(Orleans) w*ine is placed in shallow ____ with considerable ____ to the air, and the acetic acid bacteria develop as a slimy ____ on the top of the liquid. The bacteria come in contact with both the air and the substrate only at the ____ In the second process the contact between the bacteria, air, and substrate is increased by ____ the alcoholic liquid over beechwood twigs or wood ____. The acetic acid ____ accumulates in the collecting chamber and is recycled through the generator until the acetic acid content reaches at least 4%, the minimum for a product to be ____ as "vinegar." Finally, the ____ *method* is basically a ____ fermentation such as was already described for antibiotic production.

29. Match the synonyms.

medium, liquid, absolutely, go up, transform, surface, flavour, concentrate, reach, juice, environment, grow, completely, provide, accumulate, scent, ensure, smell, top, provide, develop, component, ingredient, aroma, achieve, increase, supply, convert.

30. Supply the definitions for the following notions

vinegar, *acetic acid, distilled,* vat, *Acetobacter,* aeration.

31. Prepare the text for the back translation.

32. Discuss the situations using the Conditional Mood of the verbs as well as the connective and argumentation words.

1. Bacteria – producers of vinegar. 2. Processes of vinegar production.

33. Translate the following abstract into English.

Для промислового одержання ферментних препаратів використовують як природні штами мікроорганізмів, так і мутантні штами.

Продуцентами ферментів можуть бути різні мікроорганізми: бактерії, гриби, дріжджі, актиноміцети. Мікроби можуть синтезувати одночасно цілий комплекс ферментів чи тільки один фермент.

В клітинах мікроорганізмів знайдено понад 1500 різних ферментів, причому в кожній клітині, згідно з розрахунками, міститься в середньому 100 тис. молекул ферментів, а на одиничний фермент припадає 0,1-0,5% від загальної кількості білку.

Технологічний процес виробництва мікробних ферментних препаратів відбувається за наступною схемою: культивування ліофілізованої стандартної культури в колбах на качалках до log-фази — перенесення інокулята в інокулятори — ферментатори малого об'єму (300-500л) та культивування до стаціонарної фази — перенесення інокуляту до культивування до стаціонарної фази — перенесення посівного матеріалу до головного ферментатора об'ємом 50м^3.

Ферментація в інокуляторах може тривати 10-80 годин. Після завершення ферментації культуральну рідину охолоджують до +5°С, центрифугують і випаровують (при t^0 < 35 °С) у вакуум-випарювальному апараті. Розчин фільтрують, пропускають крізь мембранні фільтри і ви-сушують у вакуум-розпилювальній сушарці. Сухий препарат стандартизують за активністю і направляють на фасування. Для одержання високо очищених ферментних препаратів очистку інокулята здійснюють шляхом діалізу і гельхроматографії. Іммобілізація ферментів - обмеження свободи пересування білкових молекул у просторі шляхом їх фіксування на носії, здійснюється шляхом їхньої взаємодії з іонообмінним носієм (наприклад, ДЕАЕ-целюлоза).

LESSON 15

The Conditional Mood

Part I

1. Read and memorize the following words and word combinations.

genetic engineering	генна техніка
deliberate	вільне
hereditary change	зміна спадковості
foreign, alien gene	ген – донор
host bacteria	бактерія – хазяїн
stably maintain	постійно підтримувати
employ	використовувати
ligated with	пов'язаний з
guidelines	вказівки
alteration	зміна
facilitate	полегшувати
enhance	стимулювати
root nodules	вузли, клубені кореня
reintroduce	знов вводити
restrict	обмежувати
replicate stably	стабільно копіювати
subsequent	наступний
desired phag	потрібний фаг
be available	бути в наявності, доступним
interfere with	втручатися у
in tandem (лат.)	наприкінці

2. Find the international words in the text and give their Ukrainian analogues.

3. Form the derivatives of the words below and use them in the situations of your own.

insert, incorporate, introduce, transfere, transport, manipulate, achieve, change, develop, ligate, produce, alter, employ, maintain, allow, generate, guide, construct, replicate.

4. Make up the complex words.

guide, lines; make, up; radio, active; immunity, precipitation; somatic, static; well, being; host, range.

5. Remember the following definitions.

Cloning isolation and incorporation of a fragment of DNA into a vector where it can be replicated.

Conjugation transfer of bacterial genes by direct contact.

Gene a unit of genetic information.

Genome the total complement of genes contained in a cell or virus.

Genotype the nucleotide sequence of the genome.

In situ in the natural environment.

In vivo in nature

In vitro in laboratories

Mutation an inheritable change in the base sequence of the genome of an organism.

Phage a virus that infects cells of two or more identical linear acid molecules in tandem; in virology, refers to a virus a lipoprotein membrane surrounding the virion.

Phenotype the observable characteristics of an organism.

Plasmid an extrachromosomal genetic element that has no extracellular form.

Recombination the process by which parts or all of the DNA molecules from two separate sources are exchanged or brought together into a single DNA

molecule.

Replication synthesis of DNA using DNA as a template.

Transduction transfer of host genes from one cell to another by a virus.

Transformation transfer of bacterial genes involving free DNA.

Transcription the synthesis of RNA using a DNA template.

Selection placing organisms under conditions where the growth of those with a particular genotype will be favored.

Vector (as in cloning vector) a DNA molecule that, on being replicated in a cell, brings about the replication of other genes inserted into the DNA.

6. Study the text and express your opinion on the information given. Read and translate the text.

Genetic Engineering

Genetic engineering usually implies deliberate manipulation of genes of various organisms, procaryotic or eucaryotic, in order to achieve useful products of metabolism or to cause a permanent hereditary change in the organism. Although the techniques for engineering the genetic make-up of higher eucaryotes have not been developed very well, those for lower eucaryotes (eg, yeast (qv)) and procaryotes have been developed to an extent by which foreign DNA from any source can be introduced and stably maintained in bacteria such as *Eschenchia coli.*

Two techniques usually are employed for manipulating the genes of microorganisms: *in vivo* genetic engineering in which the changes in genetic constitution are brought about in cells by processes analogous to those occurring in nature; and *in vitro* recombinant-DNA techniques in which foreign genes from entirely different sources can be ligated with stably replicating plasmid (or phage) DNA and introduced within the cells. The *in vitro* recombinant-DNA technique may involve production of entirely new

substances (eg, substances of animal origin) in microorganisms and, therefore, may involve both qualitative and quantitative changes. Because recombinant-DNA technology allows the incorporation and replication of DNA from various animal sources in bacteria – and this type of exchange is considered extremely rare in nature – this technology has generated a considerable amount of controversy regarding the safety and well-being of mankind. There are strict guidelines in various countries of the world regulating the type of experiments, the nature of the host bacterium and foreign DNA inserts, and the volume of experimental material that can be handled in laboratories involved in recombinant DNA work.

In vivo genetic engineering may involve simple mutational alteration or transfer of the genetic material leading to an enhanced yield of the product or an improvement in the quality of the product. Such techniques have led to the isolation of mutant *Actinomyces* or bacterial strains capable of producing antibiotics (qv), vitamins (qv), or amino acids (qv) in high yield. Another widely used technique employs plasmid transfer between different bacterial species or genera. Thus, entirely new genetic functions can be transferred from the chromosome of one bacterial genus to different genera in the form of plasmids.

In addition to plasmid-mediated transfer of chromosomal genes from one bacterium to another, plasmids themselves may specify functions that can be used for construction of novel strains. Wide host-range plasmids, harboring chromosomal genes encoding useful functions, eg, nitrogen fixation (qv), have been constructed that allow the transfer of nitrogen fixation genes to root nodules and other bacteria. Considerable progress also is being made to introduce nitrogen fixation and other desirable characteristics, such as resistance against harmful pests or plant viruses, to the plants themselves.

7. Say whether the following statements are true or false and

give your proofs why.

1. Genetic engineering usually implies deliberate manipulation of genes of various organisms, procaryotic or eucaryotic, in order to achieve useful products of metabolism. 2. The techniques for engineering the genetic make-up of higher eucaryotes have been developed very well. 3.The techniques for engineering the genetic make-up for lower eucaryotes (eg, yeast (qv)) and procaryotes have not been developed. 4. Recombinant-DNA technology allows the incorporation and replication of DNA from various animal sources in bacteria. 5. This type of exchange is considered extremely wide in nature. 6. This technology has generated a considerable amount of controversy regarding the quality of products obtained. 7. There is freedom in all countries of the world for this type of experiments. 8. The nature of the host bacterium and foreign DNA inserts is of no significance. 9. Bacterial strains are capable of producing antibiotics (qv), vitamins (qv), or metals (qv) in high yield.

8. Ask questions of all kinds on the text.

9. Explain the title, the topic and the main idea of the text.

10. Prepare the text abstract and essay, learn your abstract by heart.

11. Find in the text the following word combinations and translate them into Ukrainian.

From any source, changes in genetic constitution, in *vitro* recombinant -DNA techniques, foreign genes, can be ligated with, to an extent, obtain entirely new substances, allows the incorporation and replication of DNA, has generated a considerable amount of controversy, strict guidelines, foreign DNA inserts, leading to an enhanced yield, improvement in the quality, encoding useful functions, transfer of nitrogen fixation genes, root nodules, desirable characteristics, resistance against harmful pests.

12. Find the English equivalents of the following Ukrainian words.

Різні організми, генетичне перетворення, може бути введений, привносити зміни, що зустрічаються в природі, з абсолютно різних джерел, постійно діляться, речовини тваринного походження, кількісні та якісні зміни, цей вид обміну, викликати протиріччя, вважатися рідким в природі, стосовно безпеки людства, переносити ген, бактерія – господар, ДНК – донор, мутаційні зміни, розробити метод, для того, щоб; звичайно означає, розвиток досліджень, у галузі генної техніки.

13. Fill in the gaps.

transfer, occurring, replication, alteration, ligated, employed, improvement, maintained, cause, implies, introduced, hereditary, make-up, achieve, extent, brought about, qualitative, quantitative.

Genetic engineering usually ____ deliberate manipulation of genes of various organisms in order to ____ useful products of metabolism or to ____ a permanent ____ change in the organism. Although the techniques for engineering the genetic ____ of higher eucaryotes have not been developed very well, those for lower eucaryotes (eg, yeast (qv)) and procaryotes have been developed to an ____ by which foreign DNA from any source can be ____ and stably ____ in bacteria. Two techniques usually are ____ for manipulating the genes of microorganisms: *in vivo* genetic engineering in which the changes in genetic constitution are ____ in cells by processes analogous to those ____ in nature; and *in vitro* recombinant-DNA techniques in which foreign genes from entirely different sources can be ____ with stably replicating plasmid. The *in vitro* recombinant-DNA technique may involve both ____ and ____ changes. Recombinant-DNA technology allows the incorporation and ____ of DNA in bacteria – *In vivo* genetic engineering may involve simple mutational ____ of transfer of the genetic material leading to an ____ in the quality of the product. Another widely used technique employs plasmid ____ between different bacterial species or genera.

14. Match the synonyms.

Engineering, involve, alteration, foreign, regulation, building, matter, manufacture, produce, isolate, build, break, transform, insert, apply, use, inborn, imply, lead, generate, convert, introduce, make, change, technique, include, hereditory, incorporate, ligate, guide.

15. Give the antonyms of the following words and use them in situations.

Foreign, introduce, stable, place, leave, able, break, identical, ruin.

16. Learn the derivatives and use them in situations.

Gene – genetic – genetically – genetics – genome – genera – generate – generation, insert – inserted – inserting – insertion, form – formal – formation – formed – forming – deform – deformation – inform – information – transform – transformation – uniform.

17. Match the notions and their definitions.

1) in vivo, gene, mutational, in vitro, phagocyte, microorganism, treat, drug, advance, science, reintroduce, interferon, replicate, transfer, modify, qualitative, transgenic, improve, treatment.

2) one of the factors controlling heredity; infects cells of two or more identical linear acid molecules in tandem; causing inheritable change in the genome of an organism; knowledge arranged in an orderly manner; substance used for medical purposes either alone or in a mixture; tiny little creature that can be seen only with the help of a microscope; give medical or sugrical care to; forward movement, progress; in nature; changes in quality; make a copy; recombinant-DNA technology; introduce again; biologically functional protein; make or become better; change position (from…to); make changes in, make different; way of dealing with something; genetically engineered plants.

18. Analyze the tense and voice of the verbs in the text. Use them in the sentences.

19. Finish the conditional sentences.

1. It would be much better if____. 2. There would have been ____. 3. There might be _____. 4. There could have been ____. 5. Whatever might happen ____. 6. Whatever the reasons ____. 7. Whenever we used it ____. 8. Wherever applied ___. 9. Whoever could use ____. 10. I would rather ____. 11. I would sooner ____. 12. You had better ____ .

20. Use the Suppositional Mood of the verbs below to express command, order, or advice about your studies.

Model 1. The Common Aspect.

Present. I suggest / order / insist / require / suppose / demand that we should gather after classes. Should you meet him tomorrow, tell him to come.

Past. It is impossible that you should have done it.

Model 2. The Continious Aspect:

Present.I, he, they should be speaking.

Past. She should have been speaking

penetrate deeper into the problem, discover, find out, know, learn, study, investigate, reveal, transform, obtain.

21. Fill in the gaps with prepositions and conjunctions.

____ the techniques ____ engineering the genetic make-up of higher eucaryotes (eg, yeast (qv)) and procaryotes have been developed ____ an extent ____ which foreign DNA ____ any source can be introduced ____ stably maintained ____ bacteria ____ *Eschenchia coli.* The ____ *vitro* recombinant-DNA technique may involve production ____ entirely new substances ____ microorganisms and, ____, may involve both qualitative ____ quantitative changes. ____ recombinant-DNA technology allows the

incorporation and replication ____ DNA ____ various animal sources ____ bacteria – and this type of exchange is considered extremely rare ____ nature – this technology has generated a considerable amount of controversy ____ the safety and well-being of mankind. *In vivo* genetic engineering may involve simple mutational alteration of transfer ____ the genetic material. ____ techniques have led ____ the isolation of mutant *Actinomyces* or bacterial strains capable of producing antibiotics (qv), vitamins (qv), or amino acids (qv) ____ high yield. Another widely used technique employs plasmid transfer ____ different bacterial species or genera. ____, entirely new genetic functions can be transferred ____ the chromosome of one bacterial genus ____ different genera ____ the form of plasmids.

22. Prepare the text for the syncroneous translation.

23. Use the Conditional Mood as well as the argumentation and connective words of to speak in dialogues about the opportunities of genetics.

1. For and against genetic engineering. 2. The opportunities of *in vitro* and *in vivo* genetic engineering. 3. Viral genetics.

24. Translate the following abstract into English.

Генетична інженерія – напрям молекулярної біології й молекулярної генетики, завдання якого полягає в спрямованому перенесенні людиною конкретних генів або комплексів їх з одного організму в інший, закріпленні цих генів у новому генегичному оточенні й забезпеченні вираження їх у даній генетичній системі.

Мета генетичної інженерії може бути досягнута кількома способами: злиттям соматичних (не статевих) клітин або протопластів різних клітин одного виду і навіть різних видів організмів перенесенням (трансплантацією) з кліти в клітину

клітинних ядер, хромосом чи їхніх фрагментів; введенням уклітини окремих конкретних генів. Останній спосіб здійснюється спеціальною галуззю генетичної інженерії – генною інженерією. Основними етапами його є одержання конкретних генів, що визначають ту або іншу ознаку клітини чи організму.

Це завдання розв'язується або хімічним синтезом гена шляхом приєднання одного до одного нуклеотидів дезоксирибонуклеїнової кислоти (ДНК) в певній послідовності, або ферментативним синтезом ДНК на матрицях інформаційної рибонуклеїнової кислоти (РНК) за допомогою фермента зворотньої транскриптази, або фрагментуванням тотальної ДНК клітини і наступним вибором фрагментів; одержанням або створенням векторних молекул – молекул ДНК, здатних приєднувати до себе фрагменти молекул ДНК будь-якого походження, проникати в клітини й розмножуватись у них чи в автономному, чи в інтегрованому стані. Такі векторні молекули створено на базі помірних бактеріофагів і плазмідів. Можливі й інші типи векторних молекул; утворення специфічних комплексів генів з векторними молекулами – створення рекомбінантних молекул; введення одержаних структур у клітини; з'ясування можливості вираження привнесеної генетичної інформації.

Part II

25. Read and sum up the text

In Vitro Genetic Engineering
(in vitro Recombinant-DNA Technology)

One technique that has made a tremendous contribution to the DNA technology, also known as molecular cloning or gene cloning. In its most

widely used and simplest form, the technique allows the incorporation of any segment of a foreign DNA, procaryotic or eucaryotic, into a piece of phage or bacterial plasmid DNA, and the recombinant-DNA segment then is reintroduced into the bacterial cell by transfection or transformation. Since the vector is the phage or bacterial plasmid DNA, it is not restricted within the cell and the foreign DNA segment replicates stably as part of the bacterial vector DNA. The simple technique of joining segments of DNA derived from procaryotes or eucaryotes with the vector DNA and the subsequent introduction into the bacterium may mark the beginning of a revolutionary way of manufacturing biologically functional proteins such as insulin (qv) and growth hormones (qv), antibodies, interferons, blood-clotting factors, and a host of other pharmacologically important compounds, by fermentation (qv).

The procedures used in combining a recombinant-DNA molecule *in vitro,* is using a plasmid as vector. The first step is to isolate and purify the desired phage or plasmid DNA to be used as a vector. Once the vector and foreign DNA are available, the DNA segments are cut in areas that should not interfere with the biological activities of the gene(s) to be cloned or of the replication, maintenance, or selectable characteristics of the vector. The specifically cut DNA fragments are mixed and joined using the enzyme DNA ligase. The recombinant molecules thus generated are introduced into the bacterial host cells.The procedure for cloning foreign DNA in *E. coli.* Both A and B genes represent selectable traits, so that introduction of foreign DNA in B gene leads to the loss of an identifiable function. REP represents replication and maintenance genes.

Once a segment of foreign DNA has been ligated with the vector problem is identifying the transformant colony that harbors the recombinant-DNA molecule. Several methods have been developed to facilitate scoring of transformants with a foreign DNA insert: insertional inactivation; direct

scoring of transformants for the traits coded by the foreign DNA; indirect selection of recombinant molecules based on size or density difference of the insert DNA; radioactive RNA probes; and *in situ* immunoprecipitation reactions.

Industrial applications of *in vitro* genetic engineering include expression of eucaryotic genes and production of eucaryotic proteins in bacteria; bacterial production of somatostatin; bacterial production of rat and human insulin; and bacterial production of interferon, human growth hormone, and vaccines against viruses such as hepatitis B and foot and mouth disease virus.

For new genotypes to arise from homologous recombination, it is essential that the two homologous sequences be genetically distinct. This is obviously the case in a diploid eukaryotic cell, which has two sets of chromosomes, one from each parent. However, in prokaryotes, genetically distinct but homologous DNA molecules are brought together in different ways, but the process of *genetic recombination* is no less important. Genetic recombination in prokaryotes occurs because *fragments* of homologous DNA from a donor chromosome are transferred to a recipient cell by one of three processes: *conjugation, transduction,* and *transformation.*

26. Explain the title, the topic and the main idea of the text.

27. Ask questions on the text.

28. Prepare the abstract and essay of the text and learn them by heart.

29. Find in the text the following word combinations and translate them into Ukrainian.

allows the incorporation, reintroduced into the bacterial cell, by transfection, it is not restricted, blood-clotting factors, to purify the desired phage, foreign DNA are available, interfere with, molecules thus generated, represent selectable traits, leads to the loss of an identifiable function,

represents replication and maintenance genes, harbors the recombinant-DNA molecule, to facilitate scoring of transformants, insertional inactivation, indirect selection, based on size or density, *in situ* immunoprecipitation reactions, expression of eucaryotic genes, foot and mouth disease virus.

30. Find the English equivalents of the following Ukrainian word combinations.

зробити великий внесок, розвиток досліджень, в лабораторії, молекулярне клонування, широко застосовується, найпростіші форми, вводити у клітину, стабільно копіювати, походити від, виробляти білки, гормони росту, важливі сполуки, перший крок, відділити потрібний фаг, ДНК – донор, втрата опізнавальної функції, пов'язана з вектором ДНК, заснований на, промислове застосування, відображення гена.

31. Fill in the gaps.

incorporation, purify, ligase, interfere, gene, replication, transfection, available, host, replicates, joining, foreign, derived.

The *in vitro* recombinant-DNA technology, also known as molecular cloning or ____ cloning. The technique allows the ____of any segment of a ____ DNA, procaryotic or eucaryotic, into a piece of phage or bacterial plasmid. The recombinant-DNA segment then is reintroduced into the bacterial cell by____ or transformation. The foreign DNA segment ____ stably as part of the bacterial vector DNA. The simple technique of ____ segments of DNA ____from procaryotes or eucaryotes with the vector DNA and the subsequent introduction into the bacterium may mark the revolution in biotechnology.The first step is to isolate and ____the desired phage or plasmid DNA to be used as a vector. Once the vector and foreign DNA are ____, the DNA segments are cut in areas that should not ____with the biological activities of the gene(s) to be cloned or of the ____ maintenance, or selectable characteristics of the vector. The specifically cut DNA

fragments are mixed and joined using the enzyme DNA ____. The recombinant molecules thus generated are introduced into the bacterial ____cells.

32. Find the words in the text to match the following definitions.

the method of isolating a functional eukaryotic gene, enzyme that copies information from RNA into DNA, the process of copying information from RNA into DNA, DNA one strand of which is complementary to the mRNA, transcription agent, viral particle, the information which is given over through genes, set of genes, make the same action or impression, something from which similar objects are made, molecular cloning or gene cloning.

33. Prepare the text for the syncroneous translation.

34. Use the Conditional Mood as well as the argumentation and connective words of to speak in dialogues about the opportunities of genetics.

1. Molecular cloning. 2. The function of The vector. 3. Industrial applications of *in vivo* genetic engineering.

35. Translate the following abstract into English.

Спадкова інформація всіх організмів міститься в ДНК, а саме в г е н а х – ділянках, які кодують певні поліпептидні ланцюги. Гени бактерій складаються з структурної (білок-кодуючої) ділянки та регуляторних ділянок – промотора та термінатора транскрипції. Сукупність всіх генів, властивих даному організму, називається генотипом. Сукупність ознак, властивих даному організму (форма, розміри, хімічний склад, біохімічна активність тощо), називається фенотипом. Місцем локалізації генетичного апарату прокаріот є нуклеоїд, який складається із замкненої в кільце молекули ДНК, довжина якої 1,0-1,4 мм. Генетичний апарат бактерій називають бактеріальною хромосомою. Він містить одну групу зчеплених генів, що спадкуються разом.

Реалізація (передавання) спадкової інформації відбувається в кілька етапів. Перед поділом клітин відбувається *реплікація* генів. Подвійна спіраль ДНК розкручується на два полінуклеотидних ланцюга, і на кожному з них комплементарно утворюється нова спіраль. Нова ДНК складається з батьківського та новосинтезованого ланцюгів. Інформація, яка закодована в ДНК, передається на рибосому за допомогою матричної РНК (м-РНК), котра під час транскрипції копіює нуклеотидну послідовність ДНК. Інформація в ДНК записана в послідовності нуклеотидів чотирьох основ: аденіну, гуаніну, тиміну, цитозину. Триплет, який складається з трьох сусідніх нуклеотидів, зветься кодон. Він кодує певну амінокислоту. Порядок з'єднання амінокислот в поліпептидні ланцюг визначається триплетами м-РНК.

Другий етап *рекогниція* – це приєднання амінокислот, що необхідні для синтезу поліпептидних ланцюгів, зі специфічними транспортними РНК (т-РНК), які доставляють амінокислоти на рибосоми. Наступний етап – *трансляція* – відбувається в рибосомах. Він полягає в перекладі генетичної інформації з мови нуклеотидів на мову амінокислот за допомогою т-РНК. Аміноацил-т-РНК приєднується своїм антикодоном до кодону м-РНК у рибосомі. До сусіднього кодону м-РНК прикріплюється друга аміноацил-т-РНК. Перша т-РНК приєднує свій амінокислотний залишок карбоксильним кінцем до аміногрупи другої амінокислоти з утворенням дипептиду, а сама звільняється і відділяється від рибосоми. Процес продовжується, доки рибосома не пройде усю ділянку, що кодує даний білок на м-РНК. Після цього відбувається термінація синтезу білку, і поліпептид, що утворився, відділяється від рибосоми. За першою рибосомою йде друга, третя і так далі. Рибосоми послідовно зчитують інформацію на одній і тій же нитці м-РНК у полісомі.

LESSON 16

Grammar Revision

Part I

1. Read and memorize the following words and word combinations.

wastewaters, effluent, sewage	стічні води
treatment, processing	обробка, лікування
convey	переносити
screen	сито
grit chamber	камера з решіткою
sedimentation	осадження
apply	застосовувати
suspended	підвішений
settleable solids	твердий осад
the trickling filter	капаючий фільтр
activated-sludge process	процес активного мулу
biological floe	біологічне середовище
cover	покривати
dispose of	розпоряджатися
entail	включати
submerged	занурений
liquid	рідина
agitation	перемішування
putrid	гнилий
recover, reclaim	відновлювати
incinerate	спалювати

2. Find the international words in the text and give their Ukrainian

analogues.

3. Form the derivatives of the words below and use them in the situations of your own.

treatment, sedimentation, settleable, collecting, conveying, using, suspended, concentration, agitation, provided, flowing, accomplished, obtaining, returned, incoming, additional, coagulation, remove, apply, sedimentation, precipitation, adsorption separation, distillation, digestion, dispose of, lowering, filtration.

4. Loook through the text to explain the necessity of multistage waste water processing. Read and translate the text.

Wastewater Treatment. Part I

Modern wastewater treatment is generally divided into three phases: primary, secondary, and tertiary. Each of these steps produces sludge, which can be disposed of or used for various purposes.

Primary Treatment. Primary treatment, or plain sedimentation, removes only the settleable solids from wastewaters. A modem system for primary treatment entails collecting the wastewaters, conveying them to a central point for treatment, using screens to remove large objects and grit chambers to remove grit, and using primary sedimentation tanks to remove the suspended settleable solids.

Secondary Treatment.There are two basic methods used in modern secondary treatment: the trickling filter and the activated-sludge process. In a *trickling filter* the wastewater is applied to the filter through rotary distributors and it is allowed to trickle down over large stone or plastic beds that are covered with microorganisms. The beds are not submerged, thus air can reach the organisms at all times.

Acfivated-Sludge Process. In this process, heavy concentrations of

aerobic microorganisms, called biological floe or activated sludge, are suspended in the liquid by agitation that is provided by air bubbling into the tank or by mechanical aerators, final sedimentation tanks are needed to separate the material from the flowing liquid.

Biodegradation has long been used to treat municipal sewage sludge and some industrial wastes. It offers some promise as a method for treating very toxic organic compounds in dilute waste streams, which are hard to treat by any other means. The biodegradation is accomplished by microorganisms that feed on the toxic compounds, obtaining energy and nutrients by breaking the chemicals down into nontoxic or less toxic components. For example, some microorganisms can break down highly toxic PCB's (polychlorinated biphenyls) and thus render them less hazardous.

Most of the biologically active sludge is then returned to the aeration tank to treat the incoming water. The concentration of active microorganisms that can be maintained in the aeration tank permits the size of the treatment plant to be relatively small, about 1 to 5 acres (0.4-2 hectares) per head of population.

5. Ask questions of all kinds on the text.

6. Explain the title, the topic and the main idea of the text.

7. Prepare the text abstract and essay, learn your abstract by heart.

8. Find in the text the following word combinations and translate them into Ukrainian.

primary treatment, produces sludge, disposed of, removes only entails, collecting the wastewaters, conveying to, grit chambers, suspended settleable solids, the trickling filter is applied to, through rotary distributors, is allowed to trickle down, reach the organisms, called biological floe, by

agitation, provided by air bubling into, the flowing liquid, offers some promise, dilute waste streams, by any other means, biodegradation is accomplished, render them less hazardous, returned to the aeration tank, to treat the incoming water, can be maintained.

9. Find the English equivalents of the following Ukrainian word combinations.

переробка стічних вод, різного призначення, просте осадження, вторинна переробка, осаджуюча цистерна, процес активованого мулу, через роторні дистрибутори, над кам'яними пластами, вкритими мікроорганізмами, не занурені, у високих корцентраціях, взвішені у рідині, міські стічні води, годуватися токсичними сполуками, отримувати енергію та поживні речовини, розщеплюючи хімічні речовини на, дозволяє невелики об'єми переробки, на душу населення.

10. Fill in the gaps.

trickling, conveying, separate, treatment, effluent, covered, remove, acfivated-sludge, wastewater, submerged.

1. Modern ____ treatment is generally divided into three phases: primary, secondary, and tertiary. 2. A modem system for primary ____entails collecting the wastewaters. 3. Wastewaters are ____ to a central point for treatment. 4. Screens are used to ____ large objects and grit chambers to remove grit. 5. Primary sedimentation tanks are used to remove the suspended settleable solids. 6. In a ____ filter the wastewater is applied to the filter through rotary distributors. 7. Wastewater is allowed to trickle down over large stone or plastic beds that are ____ with microorganisms. 8. The beds are not ____ , thus air can reach the organisms at all times. 9. In ____ process, heavy concentrations of aerobic microorganisms are suspended in the liquid by agitation provided by aerators.10. Final sedimentation tanks are needed to ____ the material from the flowing liquid. 11.Tertiary treatment is primarily

intended to further clean, or polish, secondary treatment plant ____ by removing additional suspended material.

11. Make up word combinations.

1) remove, collect, convey, use, suspend, apply, trickle down, cover, call, provide, need, flow, separate, accomplish, feed on, obtain, break, return, treat, maintain, depend on, settle down.

2) wastewater, screens, large objects, grit, sedimentation tanks, settleable solids, filter, large stone bed, air, method, biological floe, activated sludge, liquid, mechanical aerators, material, municipal sewage sludge, some industrial wastes, very toxic organic compounds, biodegradation, nutrients, chemicals, incoming water, active microorganisms, size of the treatment plant.

12. Discuss the derivatives. Does the word denote / signify an object, action, process, property, person, phenomenon or other?

act – active – activate – activity – activation, waste – wasteless – wasteful – wastewater, collect – collection – collector – collective, degrade – degradable – degradation, move – remove – removal – removed – removing.

13. Define the notions.

wastewater, treatmen, trickling filter, activated sludge, municipal sewage, PCB' sedimentation, remove, settleable solids, aeration tank, biodegradation.

14. Analyze the tense and voice of the verbs in the text. Use them in the sentences.

15. Complete the conditional sentences.

1. **Unless** you had studied history, you ____. 2. We wouldn't have gone on this trip **unless** it ____ . 3. **If only** we ____. 4. **I wish** I ____ . 5. **He sounds as if** he ____. 6. **It looks as if** it ____ . 7. I aked them so that they

____ . 8. **Suppose** I ____ . 9. **In case** we ____ . 10. **Provided** you ____.

16. Transform the infinitives into the sentences of supposition.

Model. Mind to publish the results. ─ Mind that you should publish the results.

1. A modem system for primary treatment entails collecting the wastewaters, conveying them to a central point for treatment, using screens to remove large objects and grit chambers to remove grit, and using primary sedimentation tanks to remove the suspended settleable solids. 2. Trickling filter is designed for the wastewater to trickle down over large stone or plastic beds that are covered with microorganisms. 3. The beds are not submerged, thus air can reach the organisms at all times. 4. Final sedimentation tanks are needed to separate the material from the flowing liquid. 5. Biodegradation has long been used to treat municipal sewage sludge and some industrial wastes. 6. Most of the biologically active sludge is then returned to the aeration tank to treat the incoming water. 7. The concentration of active microorganisms that can be maintained in the aeration tank permits the size of the treatment plant to be relatively small, about 1 to 5 acres (0.4-2 hectares) per head of population.

17. Transform one of the sentences into the infinitive or participle.

1. In a trickling filter the wastewater is applied to the filter through rotary distributors and it is allowed to trickle down over large stone or plastic beds that are covered with microorganisms. 2. The beds are not submerged, thus air can reach the organisms at all times. 3. Each of these steps produces sludge, which can be disposed of or used for various purposes. 4. Heavy concentrations of aerobic microorganisms, called biological floe or activated sludge, are suspended in the liquid by agitation that is provided by air bubling into the tank or by mechanical aerators. 5. The biodegradation is accomplished by microorganisms that feed on the

toxic compounds, obtaining energy and nutrients by breaking the chemicals down into nontoxic or less toxic components. 6. Some microorganisms can break down highly toxic PCB's (polychlorinated biphenyls) and thus render them less hazardous.

18. Transform the infinitives in the text into the gerunds or back.

19. Prepare the text for the synchroneous translation.

20. Use the Conditional Mood as well as the connective and argumentation words to discuss the following topics.

1. Primary Treatment. 2. Secondary Treatment. 3. Activated sludge process.

21. Translate the following text into English

Харчові підприємства, розташовані в містах та інших великих населених пунктах, як правило, зливають свої стоки в комунальну каналізацію. Стічні води харчових підприємств очищають попередньо на заводських локальних очисних спорудах, а потім подають на міські. Застосовують споруди механічної, фізико-хімічної та біологічної очистки.

Під час механічної очистки із стічних вод вилучають нерозчинні забруднення. Фізико-хімічний спосіб дозволяє вилучити із стічних вод дрібні завислі частинки, які не затримуються спорудами механічної очистки. Стічні води обробляють коагулянтами (найчастіше вапном із солями заліза чи алюмінію), під дією яких завислі частинки утворюють пластівці і випадають в осад.

В біологічній очистці стічних вод беруть участь мікроорганізми – гетеротрофи, які розкладають органічні речовини (білки, вуглеводи, жири та ін.), а також мікроорганізми – хемоавтотрофи, що викликають перетворення мінеральних речовин. Серед них є анаеробні мікроорганізми, які діють переважно на почат-

кових стадіях, і аеробні, що закінчують процеси мінералізації.

Біологічна очистка стічних мод може здійснюватись в природних умовах – на полях фільтрації, зрошування, в біологічних ставках, а також в штучних спорудах – біологічних фільтрах, аеротенках. Завдяки невеликій глибини (0,6 – 1,5 м) вода в біологічних ставках добре аерується шляхом дифузії, іноді застосовують штучну – механічну чи пневматичну аерацію.

Біологічні фільтри являють собою резервуари з подвійним дном: нижнє – суцільне, верхнє – у вигляді колосникової решітки. На неї кладуть завантажувальний матеріал: щебінь, гальку, шлак, керамзит, пластмаси. Зверху в біофільтр подається стічна рідина, а знизу – повітря. На поверхні завантажувального матеріалу утворюється біологічна плівка, яка адсорбує органічні речовини. Мікроорганізми, що населяють плівку, здійснюють їх мінералізацію.

Part II

22. Read and sum up the text.

Wastewater Treatment. Part II

Tertiary Treatment. Tertiary treatment is designed for use in areas where the degree of treatment must be more than 85% to 95% or where the wastewater, after treatment, is reused. It is primarily intended to further clean, or polish secondary treatment plant effluents by removing additional suspended material and lowering the BOD, generally by filtration.To eliminate such constituents of wastewaterthe as dissolved solids, including the nutrients, synthetic organic chemicals, and heavy metals, other methods of treatment have been devised. These processes include coagulation and sedimentation, precipitation, adsorption on activated carbon or other adsorbants, foam separation, electrodialysis, reverse

osmosis, ion exchange, and distillation.

Handling Sludge. Sludge is highly capable of becoming putrid and can itself be a major pollutant if it is not biologically stabilized and disposed of in a suitable manner. Biological stabilization may be accomplished by aerobic or anaerobic digestion. In aerobic digestion, the solids are decomposed over long periods of time in the presence of aerobic microorganisms. In anaerobic digestion, which is much more common, the solids are placed in an airless tank containing anaerobic organisms. Methane, carbon dioxide, and water are produced as a result of anaerobic digestion. The methane is often recovered for fuel to heat the tank or to produce power.

Caution must be exercised when these sludges are used as a fertilizer for edible crops because disease-causing organisms may survive the processing. The dewatered sludge may be heat-dried if it is to be reclaimed or it may be incinerated.

23. Ask questions of all kinds on the text.

24. Prepare the abstract and essay of the text, learn them by heart.

25. Find in the text the following word combinations and translate them into Ukrainian.

is primarily intended, plant effluents, to eliminate dissolved solids, adsorption on activated carbon, foam separation, reverse osmosis, ion exchange, highly capable of becoming putrid, in a suitable manner, the solids are decomposed, much more common, an airless tank, recovered for fuel, caution must be exercised, used as a fertilizer, edible crops, disease-causing organisms, may survive the processing, the dewatered sludge, may be heat-dried, may be incinerated.

26. Find the English equivalents of the following Ukrainian word

combinations.

призначений (2) для, для використання у місцевості, надалі очищати, методи осадження (2), ступінь очистки, вода знову використовується, видаляти (2) домішки, знизити BOD, розчинені тверді речовини, складові стічних вод, важкі метали, розроблені методи, інші сорбенти, головний забруднювач, анаеробне травлення, поміщати у, нагрівати цистерну, виробляти енергію, бути обережним, для відновлення.

27. Fill in the gaps.

suspended, putrid, digestion, caution, precipitation, nutrients, reclaimed, disposed of, foam, devised, eliminate, designed, recovered, survive, solids, lowering, effluents.

Tertiary treatment is ____ for use in areas where the degree of treatment must be more than 85% to 95. It is primarily intended to further clean, or polish, secondary treatment plant ____ by removing additional ____ material and ____ the BOD, generally by filtration.To ____ such constituents of wastewaterthe as dissolved ____ , including the ____ synthetic organic chemicals, and heavy metals, other methods of treatment have been ____. These processes include coagulation and sedimentation, ____, adsorption on activated carbon or other adsorbants, ____ separation, electrodialysis, reverse osmosis, ion exchange, and distillation. Sludge is highly capable of becoming ____ and can itself be a major pollutant if it is not biologically stabilized and ____ in a suitable manner. Biological stabilization may be accomplished by aerobic or anaerobic ____. The methane produced is often ____ for fuel to heat the tank or to produce power. ____ must be exercised when these sludges are used as a fertilizer for edible crops because disease-causing organisms may ____ the processing. The dewatered sludge may be heat-dried if it is to be ____ or it may be incinerated.

28. Match the synonyms.

sediment, wastewater, contaminate, design, eliminate, finish, settle, reclaim, constituents, remove, break, effluent, devise, precipitate, intend, decompose, pollute, stream, sewage, accomplish, intoxicate, recover, components.

29. Prepare the text for the syncroneous translation.

30. Discuss the situations using the Conditional Mood of the verbs as well as the connective and argumentation words.

1. Tertiary Treatment. 2. Handling sludge. 3. Problems of drinking water. 4. Caution measures in treating sludge.

31. Translate the following text into English.

Найсучасніші і найпоширеніші споруди для біологічної очистки стічних вод – аеротенки. В них процес мінералізації стічних вод прискорює активний мул. Активний мул – це колоїдна маса, що містить велику кількість мікроорганізмів: бактерії, найпростіші (інфузорії, коловоротки, нематоди), гриби.

Очистка стічних вод під дією мулу проходить в дві стадії. Спочатку здійснюється фізична очистка, оскільки в результаті сорбції активним мулом завислі в стічній рідині органічні речовини коагулюють, утворюючи пластівці, і осідають. Після цього йдуть процеси біологічної очистки, внаслідок чого різко знижується загальна кількість мікроорганізмів, гинуть патогенні бактерії.

В процесі очистки стічні води звільняються не тільки від забруднень, а й від мікроорганізмів, які частково затримуються фільтруючим шаром в очисних спорудах, частково відмирають – по мірі зменшення у воді необхідних їм живильних речовин. Однак стічні води, що пройшли очистку, все ще містять велику кількість мікроорганізмів. Серед них можуть бути і патогенні, особливо збудники шлунково-

кишкових захворювань, тому в стічній воді визначають колі-титр, колі-індекс і загальну кількість бактерій за тестом МАФАМ, яка може досягати сотень мільйонів в 1 $см^3$. Колі-титр господарсько-фекальних вод звичайно становить 0,000001 $см^3$ і нижче. Тому перед зливанням у відкриті водоймища очищену воду обеззаражують, найчастіше хлоруванням. Обов'язковому обезшкодженню підлягають каналізаційні води м'ясо- і птахокомбінатів, лікарень.

Додаток 1

THE ENGLISH PREFIXES AND SUFFIXES

Prefixes			
absorb	всотувати	**intra**cellular	внутрішньоклітковий
adsorb	відокремлювати	**in**volve	включати
antivirus	противірусний	**mono**syclic	одноцикловий
attach	приєднувати	**multi**cellular	багатоклітинний
compound	сполука	**over**estimate	переоцінити
contain	містити	**poly**vitamin	багатовітамінний
derivative	похідний	**post**factum	після факту
destroy	(роз) руйнувати	**pre**pare	підготувати
dissolve	розчиняти	**pro**vitamin	похідний
engage	зв'язувати	**re**store	відновлювати
exclude	виключити	**semi**synthetic	напівсинтетичний
heterogenous	неоднорідний	**sub**system	підсистема
homogenous	однорідний	**trans**fere	переносити
immiscible	незмішуваний	**under**cook	недоготувати
incomplete	неповний	**under**lie	підлягати
intermediate	проміжний	**uni**cellular	одноклітинний

Продовження

Suffixes			
Nouns		**Adjectives**	
build**ing**	будова	beauti**ful**	гарний
engin**eer**	інженер	use**less**	некорисний
link**age**	зв'язок	differ**ent**	різний
treat**ment**	обробка	eas**y**	легкий
meas**ure**	міра	import**ant**	важливий
reac**tion**	реакція	posit**ive**	позитивний
subst**ance**	речовина	cap**able**	здатний
diffu**sion**	дифузія	sol**uble**	розчинний
technolog**ist**	технолог	chemic**al**	хімічний
soft**ness**	м'якість	liqu**id**	рідкий
mechan**ism**	механізм	dange**ous**	небезпечний
proper**ty**	властивість	organ**ic**	органічний
leader**ship**	керівництво	cellul**ar**	клітковий
Verbs			
awak**en**	будити	liber**ate**	вивільняти
diff**er**	відрізнятися	suppl**y**	постачати
establ**ish**	встановлювати	util**ize**	використати

Додаток 2

THE ENGLISH VERB TENSE FORMS

Active Voice

Aspect	Tense	Affirmative Sentence (Statement)	Question	Negative Sentence
Indefinite Tense (Simple)	Present	I / we / you / they + V_1 he / she / it + V_1 (e)s	do + S+ V_1 does+ S + V_1	S + do / does not + + V_1
	Past	S+ V_2	did + S + V_1	S + did not + V_1
	Future	will+ V_1	will + S + V_1	S + will not + + V_1
Continuous Tense	Present	I am / he / she / it is, you / we / they are + + V_{ing}	be_1 + S + V_{ing}	S + be_1 not + + V_{ing}
	Past	S + was (однина) / were (множина) + V_{ing}	be_2 + S + V_{ing}	S + be_2 not + + V_{ing}
	Future	S + will be + V_{ing}	will + S + be + V_{ing}	S + will be not + + V_{ing}
Perfect Tense	Present	I / you / we / they have, he / she / it has + V_3	have / has + S+ V_3	S + have / has not+ + V_3
	Past	S + had + V_3	had + S + V_3	S + had not + V_3
	Future	S + will have + V_3	will + S + have + + V_3	S + will have not + + V_3
Perfect Continuous Tense	Present	S + have / has been + + V_{ing}	have / has + S + been + V_{ing}	S + have / has not been + V_{ing}
	Past	S + had been + V_{ing}	had + S + been + + V_{ing}	S + had not been + + V_{ing}
	Future	S + will have been + V_{ing}	will + S + have been + V_{ing}	S + will not have been+ V_{ing}

Продовження

Passive Voice

Aspect	Tense	Affirmative Sentence (Statement)	Question	Negative Sentence
Indefinite Tense (Simple)	Present	S + be_1 + V_3	be_1 + S + V_3	S + be_1 not + V_3
	Past	S + be_2 + V_3	be_2 + S + V_3	S + be_2 not + V_3
	Future	S +will be + V_3	will + S + be + V_3	S + will not be + V_3
Continuous Tense	Present	S + be_1 + being + V_3	be_1 + S + being + V_3	S + be_1 not + being + V_3
	Past	S + be_2 + being + V_3	be_2 + S + being + V_3	S + be_2 + not + being + V_3
Perfect Tense	Present	S + have / has been + + V_3	have / has + S + been + V_3	S + have / has not been + V_3
	Past	S + had been + V_3	had + S + been + V_3	S + had not been + V_3
	Future	S + will have been + V_3	will + S + have been + V_3	S + will not have been + V_3

S – subject
$V_{1, 2, 3}$ – verb in the 1st, 2d, 3d form
$be_{1,}$ – am, is, are
be_2 – was, were

продовження

THE VERBALS FORMS

The Infinitive Forms

Tense	Voice	
	Active	**Passive**
Indefinite	to make	to be made
Continuous	to be making	—
Perfect	to have made	to have been made
Perfect Continuous	to have been making	—

The Infinitive Functions

Function	Example
Subject	To experiment is necessary.
Object	People made bacteria serve them.
Attribute	The solution to be heated contains bacterial cells .
Adverbial Modifier	Antibiotics are used to treat infectious diseases.
Compound Nominal Predicate	The idea is to use plant preparations.

Продовження

The Complex Subject With The Infinitive The Complex Object With The Infinitive

The anti-AIDS vaccin is said to have been already developed.	We know him to be a prominent scientist.

The Participle Forms

Tense	**Voice**	
	Active	**Passive**
Present	makng	being made
Perfect	having made	having been made
Past	—	made

The Participle Functions

Function	**Example**
Attribute	Yeasts are fungi producing enzymes.
Adverbial Modifier	Transforming the sells the viri are destroying the body .
Part of a compound nominal predicate	The students are discussing the culture media.

Продовження

The Absolute Nominative Participle Construction

1. The fermentation completed, the product was extracted.
2. Pharmacologists develop drugs, many of them saving our lives.

The Gerund Forms

Tense	**Voice**	
	Active	**Passive**
Indefinite	making	being made
Perfect	having made	having been made

The Gerund Functions

Function	**Example**
Subject	Using transgenic plants and animals is not safe.
Object	The preparation needs filtering.
Attribute	In the process of living our cells are replaced.
Adverbial Modifier	Microbes take part in creating microflora in our intestines.
Part of a compound nominal predicate	The task was inhibiting the harmful microorganisms.

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ЗМІСТ

Навчальне видання

ТКАЧЕНКО Наталія Дмитрівна
АВРАМЕНКО Ольга Петрівна

АНГЛІЙСЬКА МОВА

Посібник для аспірантів та студентів вищих учбових закладів харчової помисловості за напрямом “Біотехнологія”

Навчальний посібник