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D.A. Sobirova, , N.A.Isakova**

ENGLISH FOR MASTERS-II



Samarkand-2011

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**Recommended by the Council
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А н н о т а ц и я

Ушбу услубий ишланма магистратура босқичи талабалари учун мўлжалланган бўлиб, «Инглиз тили» фани ўқув дастури талабаларига асосан ишлаб чиқилган. Ушбу услубий ишланма биология, кимё, математика ва физика факультетлари талабалари учун мўлжалланган. Ушбу ишланма дарс машғулотлари ва мустақил машғулотлар учун тўғри келади.

Услубий ишланманинг мақсади талабаларга турли мутахассислик матнларини ўқиш ва тушуниш, шунингдек, матналрдаги мавжуд лексика билан танишиш, қўллашни ўргатишдир. Матнни тушуниш унга саволлар бериш ва жавоб топа олиш билан белгиланади. Шу сабабли матнларга тегишли бир қатор лексик ва грамматик машқлар ҳам тақдим этилган.

Бундан ташқари, ишланма оғзаки нутқ кўникмасини оширишга, ўқилган матнни тушунтиришда ёрдам беради. Муаллифлар лексик материални тўплашда талабалар дунёқарашини кенгайтиришга ва уларнинг луғат бойлигини ошириш ҳамда ижодий фикрни ривожлантиришга ҳаракат қилишди.

Тақризчилар: **доц. Одилов Б.Б.**
 доц. Нурмухаммедов А

Кириш сўзи

Ўзбекистон таълим тизимидаги Олий таълим босқичи бакалаврият ва магистратура ўз ичига олади. Магистратура таълимнинг асосий мақсади бакалавриятдан сўнг 2 йил давомида аниқ бир мутахассисликни чуқур ўрганишдан иборат. Магистратурада таълим олиш жараёнида талаба ўзи танлаган мутахассислиги бўйича илмий тадқиқот, илмий-педагогик ва бошқарув-касбий фаолияти бўйича мустақил иш юрита олиш малакаларига эга бўлади.

Амалий чет тили дарсларининг асосий мақсади-талабалар нутқ фаолиятининг барча турлари бўйича кўникма ва малакаларни такомиллаштириш, шунингдек, ҳар бир магистрантнинг тил ихтисослигига боғлиқ соҳавий кўникмаларни шакллантиришдан иборат бўлиб, ижтимоий, сиёсий, илмий, бадиий ва бошқа матнларни ифодали ўқиш, матнларнинг мазмунини тушуниб, зарур маълумотларни ола билиш, монолог ва диалог шаклида гапира олиш, илмий услубнинг оғзаки ва ёзма шаклини амалий эгаллаш, она тилидан чет тилига ва чет тилидан она тилига мутахассисликка оид матнларни оғзаки ва ёзма таржима қилиш, ёзма равишда ўз фикрини байн қила олиш (хат ёзиш, илмий диссертация, мақола ва тезислар ёза олиш) каби малакаларни ривожлантиришдир.

Амалий чет тили фани замонавий педагогик технологиялар, нутқ модуллари асосида ташкил этилиб, талабаларда мустақил ва эркин фикрлаш малакаларини ривожлантиришга қаратилган.

Магистратура таълимида чет тилини уқитишдан мақсад- тинглаб тушуниш, яъни илмий, бадиий ва ижтимоий-сиёсий матнларни селектив ва батафсил тушунишни ўргатиш, оғзаки ва ёзма нутқ мавзулари бўйича монолог ва диалогик нутқда иштирок этиш, репликалар тузиш ва уларга жавоб қайтариш, суҳбатдош билан мунозарага киришиш, нутқ вазиятига кўра маъруза қилишдир. Магистрант яхши ёзув услубига эга бўлиши, яъни илмий-бадиий ахборотни, мақола, диктант, баён, иншо ёза билиши керак.

Шу мақсаддан келиб чиқиб, магистратура учун услубий ишланманинг II қисмини яратишга киришдик. Ишланма қуйидагилардан иборат: физика, биология, кимё ва математика мутахассисликларига оид матнлар, талабаларнинг сўз бойлигини ривожлантиришга ва ўтилган грамматик мавзуларни такрорлаб, чуқур ўрганишга қаратилган-лексик-грамматик машқлар, шунингдек, ўқиб, ўрганиб, диалог, монолог ёки турли хил вазиятларда қўллаш учун мақоллар ҳам келтирилган. Ишланмада шунингдек, мустақил ўқиш учун матнлар ҳам келтирилган.

Ўйлаймизки, ушбу услубий ишланма биология, кимё, физика ва математика таълим йуналишлари магистрларига инглиз тилини чуқурроқ ўрганишда катта ёрдам беради.

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PART-I
PHYSICS
Mass

Mass is a property of a physical object that quantifies the amount of matter it contains. Unlike weight, the mass of something stays the same regardless of location. It is a central concept of classical mechanics and related subjects.

There are three different quantities called *mass*:

- ***Inertial mass*** is a measure of an object's resistance to changing its state of motion when a force is applied. An object with small inertial mass changes its motion more readily, and an object with large inertial mass does so less readily.
- ***Passive gravitational mass*** is a measure of the strength of an object's interaction with the gravitational field. Within the same gravitational field, an object with a smaller passive gravitational mass experiences a smaller force than an object with a larger passive gravitational mass. (This force is called the weight of the object. In informal usage, the word "weight" is often used synonymously with "mass", because the strength of the gravitational field is roughly constant everywhere on the surface of the Earth. In physics, the two terms are distinct: an object will have a larger weight if it is placed *in* a stronger gravitational field, but its passive gravitational mass remains unchanged.)
- ***Active gravitational mass*** is a measure of the strength of the gravitational field due to a particular object. For example, the gravitational field that one experiences on the Moon is weaker than that of the Earth because the Moon has less active gravitational mass.

Although inertial mass, passive gravitational mass and active gravitational mass are conceptually distinct, no experiment has ever unambiguously demonstrated any difference between them. One of the consequences of the equivalence of inertial mass and passive gravitational mass is the fact, famously demonstrated by Galileo Galilei, that objects with different masses fall at the same rate, assuming factors like air resistance are negligible. The theory of general relativity, the most accurate theory of gravitation known to physicists to date, rests on the assumption that inertial and passive gravitational mass are completely equivalent. This, is known as the weak equivalence principle. Classically, active and passive gravitational mass were equivalent-as a consequence of Newton's third law, but a new axiom is required in the context of relativity's reformulation of gravity and mechanics. Thus, standard general relativity also assumes the equivalence of inertial mass and active gravitational mass; this equivalence is sometimes called the strong equivalence principle.

Units of mass

In, the SI system of units, mass is measured in kilograms (kg). Many other units of mass are also employed, such as: grams (g), metric tons, pounds, ounces, long

and short tons, quintals, slugs, atomic mass units, Planck masses, solar masses, and eV/c^2 .

The eV/c^2 unit is based on the electron volt (eV), which is normally used as a unit of energy. However, because of the relativistic connection between (rest) mass and energy, $E = mc^2$ (see below), it is possible to use any unit of energy as a unit of mass instead. Thus, in particle physics where mass and energy are often interchanged, it is common to use not only eV/c^2 but even simply eV as a unit of mass (roughly 1.783×10^{-36} kg). Because the gravitational acceleration is approximately constant on the surface of the Earth, a unit like the pound is often used to measure *either* mass or force (e.g. weight), although the pound is officially defined as a unit of mass.

Exercises

Exercise 1. Pronounce and remember the following:

Mass-масса

Mechanics-механика

Motion-харакат, движение

Measure-ўлчов, мера

Inertial-инерциал

Resistance-қаршилик, сопротивление

Completely-бутунлай, совершенно

Axiom-аксиома

Exercise 2. Form the new words with the help of suffixes. Translate them.

Concept, measure, distinct, to change, state, to demonstrate, different, to require.

Exercise 3. Translate the following into Uzbek or Russian:

To quantify, amount, regardless, gravitational, strength, surface, unambiguously, consequence, negligible, accurate, assumption, to assume.

Exercise 4. Translate the following into English:

Хусусият, миқдор, ўзгартирмоқ, куч, қўлламоқ, кўрсатмоқ, фарқ, назария, тортиш кучи, талаб қилмоқ

Exercise 5. Make up sentences from the following:

1. a property, is, mass, a physical, object, of.
2. something, same, the mass, of, stays, regardless, the same, location, of.
3. different, called, are, three, mass, there, quantities.
4. a measure, mass, is, inertial, an object's, of, resistance.
5. gravitational, passive, is, mass, a measure, the strength, of, an object's, of, interaction, with, field, the gravitational.
6. the, strength, a measure, is, mass, gravitational, active, of, the gravitational, of, field, to a practical, due, object.

Exercise 6. Translate the sentences paying attention to the Present Indefinite Tense:

1. Unlike weight, the mass of something stays the same regardless of location.
2. It is a central concept of classical mechanics and related subjects.
3. There are three different quantities called mass.
4. An object with small inertial mass changes its motion more readily.
5. An object with large inertial mass does so less readily.
6. Passive gravitational mass is a measure of the strength of an object's interaction with the gravitational field.
7. Active gravitational mass is a measure of the strength of the gravitational field due to a particular object.
8. The moon has less active gravitational mass.

Exercise 7. Make up some questions the answers of which are the following.

1. Mass is a property of a physical object that quantifies the amount of matter it contains.
2. The mass of something stays the same regardless of location.
3. It is a central concept of classical mechanics and related subjects.
4. There are three different quantities called mass.
5. Inertial mass is a measure of an object's resistance to changing its state of motion when a force is applied.
6. Passive gravitational mass is a measure of the strength of an object's interaction with the gravitational field.
7. Active gravitational mass is a measure of the strength of the gravitational field due to a particular object.
8. Because the Moon has less active gravitational mass.

Exercise 8. Answer the following questions:

1. What is mass?
2. How many quantities are there called mass?
3. What is inertial mass?
4. What is passive gravitational mass?
5. What is active gravitational mass?
6. Why is the gravitational field that one experiences on the Moon is weaker than that of the Earth?
7. Is there any difference between inertial mass, passive gravitational mass and active gravitational mass?
8. Are inertial and passive gravitational mass completely equivalent?
9. What mass were equivalent as a consequence of Newton's third law?
10. How is this equivalence sometimes called?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. A clean hand wants no washing.
2. One, who knows, that he knows, he is wise, follow him.

Matter

Matter is commonly referred to as the substance of which physical objects are composed. It constitutes the observable Universe. According to the theory of relativity there is no distinction between matter and energy, because matter can be converted to energy (see annihilation), and vice versa (see matter creation). Philosophically, matter constitutes the formless substratum of all things, which exists only potentially and from which reality is produced. In the sense of content, matter is also used in contrast to form.

In physics, it is everything that is constituted of elementary fermions. Matter occupies space and has mass. It is composed predominantly of atoms, which consist of protons, neutrons, and electrons. All gauge bosons (of which the photon is one), which mediate the four fundamental forces, are not considered matter, even though they certainly have energy and some also mass.

Matter thus consists of quarks and leptons. There are six types of quarks (strange, charm, top, bottom, up, and down) which combine to form hadrons, primarily baryons and mesons, through the strong interaction and are actually thought to always be confined. Among the baryons are the proton and the neutron, which further combine to form the nuclei of all elements of the periodic table. Usually these nuclei are surrounded by a cloud of electrons. A nucleus with as many electrons as protons, which is thus electrically neutral, is called an atom, otherwise it is an ion.

In bulk, matter can exist in several different phases, according to particle density and energy density or alternatively pressure and temperature. These phases include gases, plasmas, liquids, fluids, superfluids, solids, and Bose-Einstein condensate. As circumstances change, matter may change from one phase into another. These phenomena are called phase transitions, and their energetics are studied in the field of thermodynamics. In small quantities, matter can exhibit properties that are entirely different from those of bulk material.

Homogeneous matter has a definite composition and properties and any amount of the matter has the same composition and properties. Homogeneous matter may or may not be a mixture. Iron and brass would be examples of each. Heterogeneous matter does not have a definite composition, for example, granite.

In chemistry, matter is often restricted to chemical substances, as elementary particles like quarks and leptons have not been subject of any chemical reactions.

Exercises

Exercise 1. Pronounce and remember the following:

Теория-назария, теория

Осциру-эгалламоқ, занимать

Space-фаза, пространство

Mass-масса

Proton-протон

Neutron-нейтрон
Electron-электрон
Pressure-босим, давление

Exercise 2. Form the new words with the help of suffixes. Translate them.
Use, to form, to occupy, to consider, combine, periodic, change, exhibit, definite.

Exercise 3. Translate the following into Uzbek or Russian:
Matter, substance, observable, relatively, to exist, predominantly, mediate, primarily, hadron, baryon, meson, nucleus, particle.

Exercise 4. Translate the following into English:
Нисбийлик, мавжуд бўлмоқ, ташкил топмоқ (иборат бўлмоқ), асосий, куч, бирикмоқ, ўраб олмоқ, ядро, зарра, энергия.

Exercise 5. Make up sentences from the following:

1. constitutes, the observable, it, Universe.
2. space, occupies, matter, and, mass, has.
3. predominantly, is, of, it, composed, atoms.
4. consists, quarks, matter, and, thus, leptons.
5. types, are, six, there, quarks, of.
6. change, may, matter, from, phase, another, into, one.

Exercise 6. Translate the sentences paying attention to the Passive Voice:

1. Matter is commonly referred to as the substance of which physical objects are composed.
2. Matter can be converted to energy, and vice versa.
3. In the sense of content, matter is also used in contrast to form.
4. In physics, it is everything that is constituted of elementary fermions.
5. Usually these nuclei are surrounded by a cloud of electrons.
6. These phenomena are called phase transitions.
7. Their energetic is studied in the field of thermodynamics.
8. In chemistry, matter is often restricted to chemical substances.

Exercise 7. Make up some questions the answers of which are the following.

1. According to the theory of relativity there is no distinction between matter and energy.
2. Matter occupies space and has mass.
3. It is composed predominantly of atoms.
4. Matter thus consists of quarks and leptons.
5. There are six types of quarks, which combine to form hadrons.
6. A nucleus with as many electrons as protons, which is thus electrically neutral, is called an atom.
7. Matter can exist in several different phases.
8. Heterogeneous matter does not have a definite composition.

Exercise 8. Answer the following questions:

1. What does matter constitute?
2. Is there distinction between matter and energy according to the theory of relativity?
3. What does matter occupy?
4. What is matter composed of?
5. What does atom consist of?
6. What does matter consist of?
7. What do phases include?
8. What are nuclei usually surrounded by?
9. What is called an atom?
10. What phenomena are called phase transitions?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Men are known by the company they keep.
2. A child is hidden inside every adult.

Measurement

In classical physics and engineering, measurement generally refers to the process of estimating or determining the ratio of a magnitude of a quantitative property or relation to a unit of the same type of quantitative property or relation. A process of measurement involves the comparison of physical quantities of objects or phenomena, or the comparison of relations between objects (e.g. angles). A particular measurement is the result of such a process, normally expressed as the multiple of a real number and a unit, where the real number is the ratio obtained from the measurement process. For example, the measurement of the length of an object might be 5 m, which is an estimate of the object's length, a magnitude, relative to a unit of length, the meter.

Measurement is not limited to physical quantities and relation;; but can in principle extend to the quantification of a magnitude of any type, through application of a measurement model such as the Rasch model, and subjecting empirical data derived from comparisons to appropriate testing in order to ascertain whether specific criteria for measurement have been satisfied.

In addition, the term measurement is often used in a somewhat looser fashion than defined above, to refer to any process in which numbers are assigned to entities such that the numbers are intended to represent increasing amount, in some sense, without a process that involves the estimation of ratios of magnitudes to a unit. Such examples of measurement range from degrees of uncertainty to consumer confidence to the rate of increase in the fall in the price of a good or service. It is generally proposed that there are four different levels of measurement, and that different levels are applicable to different contexts and types of measurement process.

In scientific research, measurement is essential. It includes the process of collecting data which can be used to make claims about learning. Measurement is also used to evaluate the effectiveness of a program or product (known as an evaluation).

Exercises

Exercise 1. Pronounce and remember the following:

Process-жараён, процесс

Property-хусусият, свойство

Obtain-олмоқ, получать

Length-узунлик, длина

Degree-даража, степень

To consume-талаб қилмоқ, требовать

Price-наرخ, цена

Exercise 2. Form the new words with the help of suffixes. Translate them.

To measure, quantity, to relate, to limit, to satisfy, fashion, to define, to represent, to estimate.

Exercise 3. Translate the following into Uzbek or Russian:

Engineering, measurement, to refer, to estimate, to determine, the ratio, magnitude, to involve, application, range, to propose.

Exercise 4. Translate the following into English:

Ўлчов, аниқламоқ, ҳодиса, миқдор, маълумот, ошмоқ, ҳажм, илмий изланиш, ўз ичига олмоқ, йиғмоқ.

Exercise 5. Make up sentences from the following:

1. measurement, of, a process, the comparison, involves, physical, of, quantities, objects, of, phenomena, or.
2. the result, is, measurement, a particular, sick, of, a process.
3. the length, measurement, of, an object, of, be, 5m, might.
4. limited, is, measurement, not, quantities, physical, to.
5. different, four, levels, are, measurement, of, there.
6. research, measurement, scientific, is, in, essential.

Exercise 6. Translate the sentences paying attention to the Passive Voice:

1. Measurement is not limited to physical quantities.
2. Specific criteria for measurement have been satisfied.
3. The term measurement is often used in a somewhat looser fashion than defined above.
4. It is generally proposed that there are four different levels of measurement.
5. It includes the process of collecting data which can be used to make claims about learning.

6. Measurement is also used to evaluate the effectiveness of a program or product.
7. A process of measurement involves the comparison of physical quantities of objects or phenomena.
8. A particular measurement is the result of such a process.

Exercise 7. Make up some questions the answers of which are the following.

1. A process of measurement involves the comparison of physical quantities of objects or phenomena; or the comparison of relations between objects.
2. A particular measurement is the result of such a process.
3. The measurement of the length of an object might be 5 m.
4. Measurement is not limited to physical quantities and relatives.
5. There are four different levels of measurement.
6. Different levels are applicable to different contexts and types of measurement process.
7. It includes the process of collecting data which can be used to make claims about learning.
8. Measurement is also used to evaluate the effectiveness of a program or product.

Exercise 8. Answer the following questions:

1. What does measurement generally refer to?
2. What does a process of measurement involve?
3. What is the result of such a process?
4. Is measurement limited to physical quantities and relations?
5. How many levels are there of measurement?
6. Is measurement essential in scientific research?
7. What does measurement include?
8. What is applicable to different contexts and types of measurement process?
9. What can be used to make claims about learning?
10. What is measurement also used to?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. The proof of the pudding is in the eating.
2. Learn to work before you run.

Condensed matter physics

Condensed matter physics is the field of physics that deals with the macroscopic physical properties of matter. In particular, it is concerned with the “condensed” phases that appear whenever the number of constituents in a system is extremely large and the interactions between the constituents are strong. The most familiar examples of condensed phases are solids and liquids, which arise from the

electric force between atoms. More exotic condensed phases include the superfluid and the Bose-Einstein condensate found in certain atomic systems at very low temperatures, the superconducting phase exhibited by conduction electrons in certain materials, and the ferromagnetic and antiferromagnetic phases of spins on atomic lattices.

Condensed matter physics-is by far the largest field of-contemporary physics. By one estimate, one third of all American physicists identify themselves as condensed matter physicists. Historically, condensed matter physics grew out of solid-state physics, which is now considered one of its main subfields. The term “condensed matter physics” was apparently coined by Philip Anderson when he renamed his research group previously “solid- state theory” - in 1967. In 1978, the Division of Solid State Physics at the American Physical Society was renamed as the Division of Condensed Matter Physics. .

One of the reasons for calling the field “condensed matter physics” is that many of the concepts and techniques developed for studying solids actually apply to fluid systems. For instance, the conduction electrons in an electrical conductor form a type of quantum fluid with essentially the same properties as fluids made up of atoms. In fact, the phenomenon of superconductivity, in which the electrons condense into a new fluid phase in which they can flow without dissipation, is very closely analogous to the superfluid phase found in helium 3 at low temperatures.

Condensed matter physics is also closely related to the field of materials science. In this context, condensed matter physicists research nanotechnology, i.e. the ability to mass produce atomic-scale machines, which was first publicly envisioned by Richard Feynman.

Exercises

Exercise 1. Pronounce and remember the following:

Macroscopic-макроскопик

Property-хусусият, свойство

To appear-пайдо бўлмоқ, появляться

Include-ўз ичига олмақ, включать в себя

Electron-электрон

Research-изланиш, исследование

Reason-сабаб, причина

To develop-ривожланмоқ, развивать

Exercise 2. Form the new words with the help of suffixes. Translate them.

To appear, found, exhibit, identify, to consider, reason, concept, to develop, to apply, to relate, to produce.

Exercise 3. Translate the following into Uzbek or Russian:

To deal with, constituent, extremely, phase, solid, liquid, electric force, superfluid, condensate, ferromagnetic.

Exercise 4. Translate the following into English:

Бўлим (соха), келиб чиқмоқ, орасида, ҳисобламоқ, асосий, қайта номламоқ, масалан, квант, ҳодиса, қобилият.

Exercise 5. Make up sentences from the following:

1. the field, physics, matter, condensed, is, physics, of.
2. condensed, is, with, it, the phases “condensed”.
3. examples, the most, condensed, familiar, of phases, solid, are, liquids, and.
4. exotic, condensed, more, phases, the superfluid, include.
5. matter, physics, condensed, out, grew, solid-state, physics, of.
6. materials, of, science, the field, to, closely, related, also, is, physics, matter, condensed.

Exercise 6. Translate the sentences paying attention to the Tenses:

1. Condensed matter physics is the field of physics that deals with the macroscopic physical properties of matter.
2. It is concerned with the “condensed” phases.
3. Historically, condensed matter physics grew out of solid-state physics, which is now considered one of its main subfields.
4. The term “condensed matter physics” was apparently coined by Phillip Anderson when he named his research group-previously “solid-state theory” in 1967.
5. In 1978 the Division of Solid-State physics at the American physical society was renamed.
6. Condensed matter physics is also closely related to the field of materials science.
7. In this context, condensed matter physicists research nanotechnology, i.e. the ability to mass produce atomic-scale machines, which was first publicly envisioned by Richard Feymann.

Exercise 7. Make up some questions the answers of which are the following.

1. Condensed matter physics is the field of physics.
2. Condensed matter physics deals with the macroscopic physical properties of matter.
3. It is concerned with the “condensed” phases.
4. The most familiar examples of condensed phases are solids and liquids.
5. More exotic condensed phases include the superfluid.
6. Condensed matter physics is by far the largest field of contemporary physics.
7. Condensed matter physics grew out of solid-state physics.
8. Condensed matter physics is also closely related to the field of material science.

Exercise 8. Answer the following questions:

1. What is Condensed matter physics?

2. What does it deal with?
3. What is it concerned with?
4. What are the most familiar examples of condensed phases?
5. What arises from the electric force between atoms?
6. What do more exotic condensed phases include?
7. Who was the term “condensed matter physics” apparently coined by?
8. When did Phillip Anderson rename his research group-previously “solid-state theory”?
9. When was the division of Solid State physics at the American Physical society renamed as the Division of Condensed Matter Physics?
10. What is Condensed matter physics also closely related to?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. It is the last straw that breaks the camel’s back.
2. We never know the value of water till the well is dry.

Theoretical physics

Theoretical physics employs mathematical models in an attempt to understand Nature. Central to it is mathematical physics, though other conceptual techniques are also used. The goal is to rationalize, explain and predict physical phenomena. The advancement of science depends in general on the interplay between experimental studies and theory. In some cases, theoretical physics adheres to standards of mathematical rigor while giving little weight to experiments and observations. For example, while developing special relativity, Einstein was concerned with the Lorentz transformation which left Maxwell’s equations invariant, but was apparently uninterested in the Michelson-Morley experiment on Earth’s drift through a luminiferous ether. On the other hand, Einstein was awarded the Nobel Prize for explaining the photoelectric effect.

More is involved than the application, or even invention, of mathematics — to wit: concept formation. Archimedes realized that one could determine the volume of an irregularly-shaped object by immersing it in a liquid, and that a ship floats by displacing its weight of water. Pythagoras understood the relation between the length of a vibrating string and the musical tone it produces, and how to calculate the length of a rectangle’s diagonal. It takes special intuition to invent novel ideas, such as entropy as a measure of the uncertainty regarding the positions and motions of unseen particles, or the quantum mechanical idea that (action and) energy are not continuously variable. Sometimes it is the vision of mathematicians which provides the clue; e.g., the notion, due to Riemann and others, that space itself might be curved.

Theoretical advances often consist in setting aside old paradigms

- Heat is a fluid called caloric.

- Burning consists of evolving phlogiston.
- Astronomical bodies revolve around the Earth often replacing them with new ones.
- Physical objects are made up of molecules and atoms.
- Diseases can be caused by unseen microbes.
- Energy is exchanged in discrete packets called quanta.

It is evident that the creative mind and new theories are valuable in all fields, not just physics. But what sets physics apart, along with the allied fields of engineering and physical chemistry, is that they rely on new concepts which are susceptible to mathematical formulation.

Exercises

Exercise 1. Pronounce and remember the following:

Theoretical-назарий, теоретический
 Phenomena-ходисалар, явление
 Advancement-илгариланиш, прогресс
 Observation-кузатиш, наблюдение
 Equation-тенглама, уравнение
 Invariant-инвариант
 Experiment-тажриба, эксперимент

Exercise 2. Form the new words with the help of suffixes. Translate them.

To explain, theory, to develop, experiment, to calculate, to invent, measure, vision.

Exercise 3. Translate the following into Uzbek or Russian:

To employ, an attempt, to rationalize, predict, interplay, to adhere, rigor, apparently, luminiferous, to involve, to determine.

Exercise 4. Translate the following into English:

Назарий физика, тушунтирмак, боғлиқ бўлмак, тақдирламак, ихтиро, узунлик, зарра.

Exercise 5. Make up sentences from the following:

1. mathematical, employs, models, physics, theoretical, an attempt, in, nature, to understand.
2. to rationalize, is, the goal, and, predict, explain, phenomena, physical.
3. awarded, Einstein, was, prize, the Nobel.
4. objects, made, physical, are, up, molecules, of, atoms, and.
5. caused, be, diseases, can, unseen, by, microscope.
6. exchanged, is, energy, packets, in, called, discrete, quanta.

Exercise 6. Translate the sentences paying attention to the prepositions:

1. Central to it is mathematical physics, though other conceptual techniques are also used.
2. On the other hand, Einstein was awarded the Nobel Prize for explaining the photo electric effect.
3. Archimedes realized that one could determine the volume of an irregularly-shaped object by immersing it in a liquid.
4. Pythagoras understood the relation between the length of a vibrating string and the musical tone it produces and how to calculate the length of a rectangle's diagonal.
5. Theoretical advances often consist in setting aside old paradigms.
6. Burning consists of evolving phlogiston.
7. Physical objects are made up of molecules and atoms.
8. Diseases can be caused by unseen microbes.
9. Energy is exchanged in discrete packets called quanta.

Exercise 7. Make up some questions the answers of which are the following.

1. Theoretical physics employs mathematical models in an attempt to understand Nature.
2. The goal is to rationalize, explain and predict physical phenomena.
3. The advancement of science depends in general on the interplay between experimental studies and theory.
4. Heat is a fluid called caloric.
5. Astronomical bodies revolve around the Earth, often replacing them with new ones.
6. Physical objects are made up of molecules and atoms.
7. It is evident that the creative mind and new theories are valuable in all fields, not just physics.
8. Energy is exchanged in discrete packets called quanta.

Exercise 8. Answer the following questions:

1. What is theoretical physics?
2. What does the advancement of science depend on?
3. Who was awarded the Nobel Prize for explaining the photoelectric effect?
4. What did Archimedes realize?
5. What is heat? How is it called?
6. What does burning consist of?
7. What revolves around the Earth?
8. What are physical objects made up of?
9. What can diseases be caused by?
10. What is exchanged in discrete packets called quanta?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. The lock the stable door after the horse is stolen.
2. A cat may look at a ling.

Electric and magnetic fields

It is often convenient to understand the electromagnetic field in terms of two separate fields: the electric field and the magnetic field. A non-zero electric field is produced by the presence of electrically charged particles, and gives rise to the electric force; this is the force that causes static electricity and drives the flow of electric charge (electric current) in electrical conductors. The magnetic field, on the other hand, can be produced by the motion of electric charges, or electric current, and gives rise to the magnetic force associated with magnets.

The term “electromagnetism” comes from the fact that the electric and magnetic fields—generally cannot be described independently of one another. A changing magnetic field produces an electric field (this is the phenomenon of electromagnetic induction, which underlies the operation of electrical generators, induction motors, and transformers). Similarly, a changing electric field generates a magnetic field.

Because of this interdependence of the electric and magnetic fields, it makes sense to consider them as a single, theoretically coherent entity — the electromagnetic field. This unification, which was completed by James Clerk Maxwell, is one of the triumphs of 19th century physics. It had far-reaching consequences, one of which was the elucidation of the nature of light: as it turns out, what we think of as “light” is actually a propagating oscillatory disturbance in the electromagnetic field, i.e., an electromagnetic wave. Different frequencies of oscillation give rise to the different forms of electromagnetic radiation, from radio waves at the lowest frequencies, to visible light at intermediate frequencies, to gamma rays at the highest frequencies.

The theoretical implications of electromagnetism led to the development of special relativity by Albert Einstein in 1905.

Exercises

Exercise 1. Pronounce and remember the following:

Convenient-кулай, удобный

Separate-алоҳида, отдельный

Magnetic field- магнит майдон, магнитное поле

Electric current- электр токи, электрический ток

Electric field- электр майдон, электрическое поле

Electromagnetic induction-электромагнит индукция, электромагнитная индукция

Exercise 2. Form the new words with the help of suffixes. Translate them.
To produce, to associate, to consider, nature, different, to form, to develop.

Exercise 3. Translate the following into Uzbek or Russian:

Charged particles, electric force, to cause, electricity, electric charge, similarly, to generate, coherent, unification, triumph, elucidation.

Exercise 4. Translate the following into English:

Кулай, зарядланган зарра, электромагнит майдон, электромагнит тўлқин, радио тўлқин, гамма нурлар

Exercise 5. Make up sentences from the following:

1. electric, a non-zero, field, produced, by, electrically, is, the presence, electrically, of, particles, charged.
2. magnetic, field, a changing, an electric, produces, field.
3. field, a changing, electric, generates, field, a magnetic.
4. can, the magnetic, produced, be, by, electric, of, the motion, charges, field.
5. unification, completed, this, was, James Clerk Maxwell, by.
6. implications, the theoretical, led, of, electromagnetism, to, special, of, the development, relativity, in 1905, Albert Einstein, by.

Exercise 6. Translate the sentences paying attention to the grammar:

1. A non-zero electric field is produced by the presence of electrically charged particles.
2. The magnetic field can be produced by the motion of electric charges.
3. The term “electromagnetism” comes from the fact that the electric and magnetic fields generally cannot be described independently of one another.
4. This unification, which was completed by James Clerk Maxwell, is one of the triumphs of 19th century physics.
5. A changing magnetic field generates a magnetic field.
6. Similarly, a changing electric field generates a magnetic field.
7. Different frequencies of oscillation give rise to the different forms of electromagnetic radiation.
8. The theoretical implications of electromagnetism led to the development of special relativity by Albert Einstein in 1905.

Exercise 7. Make up some questions the answers of which are the following.

1. It is often convenient to understand the electromagnetic field in terms of two separate fields: the electric field and the magnetic field.
2. A non-zero electric field is produced by the presence of electrically charged particles, and gives rise to the electric field.
3. This is the force that causes static electricity.
4. The magnetic field can be produced by the motion of electric charges, or electric current, and gives rise to the magnetic force associated with magnets.
5. The term “electromagnetism” comes from the fact that the electric and magnetic fields generally cannot be described independently of one another.
6. A changing magnetic field produces an electric field.
7. A changing electric field generates a magnetic field.

8. The theoretical implications of electromagnetism led to the development of special relativity by Albert Einstein in 1905.

Exercise 8. Answer the following questions:

1. What is a non-zero electric field produced by?
2. What field gives rise to the electric force?
3. What does this force cause?
4. What can the magnetic field be produced by?
5. What field gives rise to the magnetic force associated with magnets?
6. What does a changing magnetic field produce?
7. What does a changing electric field generate?
8. Who was this unification completed by?
9. What is the triumph of the 19th century physics?
10. What gives rise to the different forms of electromagnetic radiation?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Empty vessels make the greatest noise.
2. So many men, so many minds.

The basic concepts of thermodynamics

The basic abstraction of thermodynamics is the division of the world into systems delimited by real or ideal boundaries. The systems not directly under consideration are lumped into the environment. It is possible to subdivide a system into subsystems, or to group several systems together into a larger system. Usually systems can be assigned a well-defined state which can be summarized by a small number of parameters.

Thermodynamic systems

A thermodynamic system is that part of the universe that is under consideration. A real or imaginary boundary separates the system from the rest of the universe, which is referred to as the environment. A useful classification of thermodynamic systems is based on the nature of the boundary and the flows of matter, energy and entropy through it.

There are three kinds of systems depending on the kinds of exchanges taking place between a system and its environment:

Isolated systems: not exchanging heat, matter or work with their environment. An example of an isolated system would be an insulated container, such as an insulated gas cylinder.

Closed systems: exchanging energy (heat and work), but not matter with their environment. A greenhouse is an example of a closed system exchanging heat, but not work with its environment. Whether a system exchanges heat, work or both is usually thought of as a property of its boundary, which can be.

Adiabatic boundary: not allowing heat exchange;

Rigid boundary: not allowing exchange of work.

Open systems: exchanging energy (heat and work) and matter with their environment. A boundary allowing matter exchange is called permeable. The ocean would be an example of an open system.

In reality, a system can never be absolutely isolated from its environment, because there is always at least some slight coupling, even if only via minimal gravitational attraction. In analyzing an open system, the energy into the system is equal to the energy leaving the system.

Exercises

Exercise 1. Pronounce and remember the following:

Thermodynamics-термодинамика

Division-бўлиш, деление

Environment-атроф-муҳит, окружение (среда)

Boundary-чегара, граница

Consideration-ҳисоблаш, соображение

Energy-энергия

Universe-олам (дунё), мир

Exercise 2. Form the new words with the help of suffixes. Translate them.

To divide, to consider, to subdivide, state, to depend, to isolate, to allow, equal.

Exercise 3. Translate the following into Uzbek or Russian:

Basic, abstraction, to assign, parameter, imaginary, matter, insulated, greenhouse, slight, gravitational, attraction.

Exercise 4. Translate the following into English:

Биргаликда, қисм, ажратмоқ, асосланмоқ, табиат, боғлиқ бўлмоқ, рухсат бермоқ

Exercise 5. Make up sentences from the following:

1. possible, to, subdivide, is, a system, it, subsystems, into.
2. systems, assigned, usually, can, a well-defined, be, state.
3. three, systems, are, kinds, systems, of.
4. allowing, exchange, a boundary, matter, called, permeable, is.
5. an example, the ocean, be, of, would, system, an, open.
6. into, the energy, is, to, leaving, the system, equal, the energy, the system.

Exercise 6. Translate the sentences paying attention to the grammar:

1. Usually systems can be assigned a well-designed state which can be summarized by a small number of parameters.
2. A thermodynamic system is the part of the universe that is under consideration.
3. A real or imaginary boundary separates the system from the rest of the universe, which is referred to as the environment.
4. A useful classification of thermodynamic systems is based on the nature of the boundary.

5. An example of an isolated system would be an insulated container, such as an insulated gas cylinder.
6. A boundary allowing matter exchange is called permeable.
7. The ocean would be an example of an open system.
8. In reality, a system can never be absolutely isolated from its environment.

Exercise 7. Make up some questions the answers of which are the following.

1. A thermodynamic system is that part of the Universe that is under consideration.
2. There are three kinds of systems.
3. An example of an isolated system would be an insulated container.
4. A greenhouse is an example of a closed system.
5. A boundary allowing matter exchange is called permeable.
6. The ocean would be an example of an open system.
7. A system can never be absolutely isolated from its environment.
8. In analyzing an open system, the energy into the system is equal to the energy leaving the system.

Exercise 8. Answer the following questions:

1. What is the basic abstraction of thermodynamics?
2. What is a thermodynamic system?
3. What is a useful classification of thermodynamic system based on?
4. How many kinds are there of systems?
5. What is isolated system?
6. What would be an example of an isolated system?
7. What is closed system?
8. What is an example of a closed system?
9. What is open system?
10. What would be an example of an open system?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. You better wear old coat, but buy a new book.
2. Don't trouble until trouble troubles you.

Heat

Heat is a branch of physics. It is only in the last century and a half that man has known much about the nature of heat. Previous to that time, heat was thought to be a weightless fluid which escaped from materials when they burned. They invented the word caloric for this imaginary fluid. Experiments by Benjamin Thompson and Sir Humphry Davy showed that mechanical energy can be converted into definite quantities of heat. Benjamin Thompson measured the amount of heat generated in boring the barrel of brass cannon. Since the boring

tool was turned by horses, who traveled around the circle, he knew now much work was put into the operation. Davy showed that blocks of ice, even at a temperature below freezing, can be melted by rubbing, them together. As a result of these experiments, scientists cast aside the erroneous caloric theory. Today we conclude that heat is a form of kinetic energy. It is manifested by the vibrations and oscillations of the molecules that make up substances.

We are particularly interested in the effects which heat produces. Solids, liquids, and gases generally increase in volume when heated. Conversely, they usually contract in size as they cool. We measure the intensity of heat in a body by its temperature. Experiments have shown that it requires a much larger quantity of heat to change a pound of water at a given number of degrees in temperature than it does to produce the same temperature change on a pound of iron. Such experiments introduce us to the subject of specific heat. Heating many substances changes them from solids to liquids. Further heating converts the liquid into a gas or vapour. The heat that is absorbed when such a change of state occurs is very considerable. Reversing the process, vapours changing to liquids, and liquids changing to solids set free the same amount of heat that was absorbed by the change of state.

Heat energy enables us to do work with suitable machines. Fuel is burnt to produce steam. The steam is used, to operate steam engines or steam turbines. Automobiles, diesel trains, and airplanes burn liquid fuels in the cylinders of their engines, producing heat which is converted into kinetic energy of motion. Friction produces heat, but the heat produced by friction is usually wasted. The digestion of fats in our diet produces heat which keeps our bodies at a nearly constant temperature, even though the temperature of the air may fluctuate widely. Electrical energy can be changed to heat in an electric iron or an electric toaster, (Such electric appliances are very convenient because they produce the heat just where it is needed, and they are also capable of accurate regulation.

Exercises

Exercise 1. Pronounce and remember the following:

Century-аср; век, столетие

To measure-ўлчамоқ; измерять

Molecule-молекула

Steam-буғ; пар

Engine-машина, двигатель

Kinetic-кинетик

Solid-қаттиқ жисм; твердое тело

Vapour- буғ; пар

Liquid-суюқлик; жидкость

Exercise 2. Form the new words with the help of suffixes. Translate them. To invent, definite, measure, generate, experiment, theory, to conclude, to manifest, effect, increase, to require, change, to introduce.

Exercise 3. Translate the following into Uzbek or Russian:

Heat, branch, previous, weightless, to escape, erroneous, vibration, oscillation, substance, to convert, fuel, friction, digestion.

Exercise 4. Translate the following into English:

Ёндирмоқ (куйдирмоқ), миқдор, айлана, муз, эримоқ, айникса, ҳажм, ишлаб чиқармоқ (ҳосил қилмоқ), модда, қулай, ҳаракат.

Exercise 5. Make up sentences from the following:

1. a branch, physics, of, is, heat.
2. the word, invented, they, caloric, this, for, fluid, imaginary.
3. conclude, today, heat, we, that, a form, is, energy, of, kinetic.
4. liquids, gases, increase, and, solids, volume, in, heated, generally, when.
5. usually, contract, they, size, in, they, as cool.
6. burnt, fuel, is, steam, produce, to.

Exercise 6. Translate the sentences paying attention to the Past Indefinite Tenses:

1. They invented the word caloric for this imaginary fluid.
2. It is only in the last century and a half that man has known much about the nature of heat.
3. Benjamin Thompson measured the amount of heat generated in boring the barrel of brass cannon.
4. Davy showed that blocks of ice, even at a temperature below freezing, can be melted by rubbing them together.
5. Experiments have shown that it requires a much larger quantity of heat to change a pound of water at a given number of degrees in temperature than it does to produce the same temperature change on a pound of iron.
6. Previous to that time, heat was thought to be a weightless fluid which escaped from materials when they burned.
7. Experiments by Benjamin Thompson and sir Humphry Davy showed that mechanical energy can be converted into definite quantities of heat.
8. He knew how much work was put into the operation.

Exercise 7. Make up some questions the answers of which are the following.

1. Heat is a branch of physics.
2. Davy showed that mechanical energy can be converted into definite quantities of heat.
3. Benjamin Thompson measured the amount of heat.
4. Today we conclude that heat is a form of kinetic energy.
5. Solids, liquids and gases generally increase in volume when heated.
6. We, measure the intensity of heat in a body by its temperature.
7. Heating many substances changes them from solids to liquids.
8. Fuel is burnt to produce steam.

Exercise 8. Answer the following questions:

1. What is heat?
2. When has man known much about the nature of heat?
3. Who invented the word caloric for this imaginary fluid?
4. What did experiments by Benjamin Thompson show?
5. What did Benjamin Thompson measure?
6. What do solids, liquids and gases generally increase in when heated?
7. How do you measure the intensity of heat in a body?
8. What is burnt to produce steam?
9. What is the steam used to?
10. What is heat produced by?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Rome was not built in a day.
2. Practice makes perfect.

Kepler's Laws

Newton wouldn't have been able to figure out why the planets move the way they do if it hadn't been for the astronomer Tycho Brahe (1546-1501) and his protege Johannes Kepler (1571-1630), who together came up with the first simple and accurate description of how the planets actually do move. The difficulty of their task is suggested by the figure below, which shows how the relatively simple orbital motions of the earth and Mars combine so that as seen from earth Mars appears to be staggering in loops like a drunken sailor. Brahe, the last of the great naked-eye astronomers, collected extensive data on the motions of the planets over a period of many years, taking the giant step from the previous observations' accuracy of about 10 seconds of arc (10/60 of a degree) to an unprecedented 1 second. The quality of his work is all the more remarkable considering that his observatory consisted of four giant brass protractors mounted upright in his castle in Denmark. Four different observers would simultaneously measure the position of a planet in order to check for mistakes and reduce random errors.

With Brahe's death, it fell to his former assistant Kepler to try to make some sense out of the volumes of data. Kepler, in contradiction to his late boss, had formed a prejudice, a correct one as it turned out, in favor of the theory that the earth and planets revolved around the sun, rather than the earth staying fixed and everything rotating about it. Although motion is relative, it is not just a matter of opinion what circles what.

The earth's rotation and revolution about the sun make it a noninertial reference frame, which causes detectable violations of Newton's laws when one attempts to describe sufficiently precise experiments in the earth-fixed frame. Although such direct experiments were not carried out until the 19th century, what convinced everyone of the sun-centered system in the 17th century was that Kepler was able to

come up with a surprisingly simple set of mathematical and geometrical rules for describing the planets' motion using the sun-centered assumption. After 900 pages of calculations and many false starts and dead-end ideas, Kepler finally synthesized the data into the following three laws: Kepler's elliptical orbit law. The planets orbit the sun in elliptical orbits with the sun at one focus. Kepler's equal-area law. The line connecting a planet to the sun sweeps out equal areas in equal amounts of time. Kepler's law of periods. The time required for a planet to orbit the sun, called its period, is proportional to the long axis of the ellipse raised to the 3/2 power. The constant of proportionality is the same for all the planets.

Although the planets' orbits are ellipses rather than circles, most are very close to being circular. The earth's orbit, for instance, is only flattened by 1.7% relative to a circle. In the special case of a planet in a circular orbit, the two foci (plural of "focus") coincide at the center of the circle, and Kepler's elliptical orbit law thus says that the circle is centered on the sun. The equal-area law implies that a planet in a circular orbit moves around the sun with constant speed. For a circular orbit, the law of periods then amounts to a statement that the time for one orbit is proportional to $r^{3/2}$, where r is the radius. If all the planets were moving in their orbits at the same speed, then the time for one orbit would simply depend on the circumference of the circle, so it would only be proportional to r to the first power. The more drastic dependence on $r^{3/2}$ means that the outer planets must be moving more slowly than the inner planets.

Exercises

Exercise 1. Pronounce and remember the following:

Simple-оддий; простой

Planet-планета

Difficulty-қийинчилик, трудность

To appear-пайдо бўлмоқ, появляться

Observation-кузатув, наблюдение

Quality-сифат, качество

Error-хато, ошибка

Attempt-уриниш, попытка

Exercise 2. Form the new words with the help of suffixes. Translate them.

To suggest, to combine, to appear, to collect, to observe, form, correct, to rotate, to connect.

Exercise 3. Translate the following into Uzbek or Russian:

To figure, protégé, accurate, orbital, giant, accuracy, remarkable, simultaneously, to reduce, random, prejudice, to revolve, rotation.

Exercise 4. Translate the following into English:

Ҳаракат қилмоқ, маълумот, ташкил топмоқ (иборат бўлмоқ), сарой, атрофида, айланиш, орбита.

Exercise 5. Make up sentences from the following:

1. their, the difficulty, task, of, is, by, suggested, the figure, below.
2. his, the quality, of, work, all, is, the more, remarkable.
3. different, would, four, observers, simultaneously, the position, measure, a planet, of.
4. motion, relative, is, although, not, is, just, it, of, a matter, opinion, what, circles, what.
5. rotation, the earth's, revolution, and, the sun, about, it, make, a non inertial, frame, reference.
6. of, the constant, proportionality, the same, is, all, for, the planets.

Exercise 6. Translate the sentences paying attention to the Past Perfect Tense:

1. The difficulty of their task is suggested by the figure below.
2. Brake collected extensive data on the motions of the planets over a period of many years.
3. The quality of this work is all the more remarkable.
4. Four different observers would simultaneously measure the position of a planet in order to check for mistakes and reduce random errors.
5. Kepler had formed a prejudice, a correct one as it turned out, in favor of the theory.
6. Although motion is relative, it is not just a matter of opinion what circles what.
7. After 900 pages of calculations and many false starts and dead-end ideas, Kepler finally synthesized the data into the following three laws.
8. The constant of proportionality is the same for all the planets.

Exercise 7. Make up some questions the answers of which are the following.

1. Brake collected extensive data on the motions of the planets over a period of many years.
2. Kepler had formed a prejudice.
3. The earth's rotation and revolution about the sun make it a non-inertial reference frame.
4. Kepler finally synthesized the data into the following three laws.
5. The line connecting a planet to the sun sweeps out equal areas in equal amounts of time.
6. The time required for a planet to orbit the sun, called its period.
7. The constant of proportionality is the same for all the planets.
8. The earth's orbit is only flattened by 1.7% relative to a circle.

Exercise 8. Answer the following questions:

1. What is suggested by the figure below?
2. Who collected extensive data on the motions of the planets over a period of many years?
3. Who had formed a prejudice?
4. What makes it a non-inertial reference frame?

5. Who synthesized the data into the three laws?
6. What is Kepler's elliptical orbit law?
7. What is Kepler's equal-area law?
8. What is Kepler's law of periods?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Never do things by halves.
2. Nothing is given so freely an advice.

The deduction of Universal Laws

The work of Galileo and Newton was only the beginning of a programme for science. Like a rock rolling down a steep hill the movement to secure fundamental mathematical laws and to deduce their consequences gathered momentum and finally caused an avalanche. By procedures similar to those of Galileo and Newton, the mass of the Sun and the mass of any planet with observable satellites were soon calculated. The success of the search for laws extended far-beyond the field of astronomy. Soon jaws binding together separate branches of science were discovered. For example, chemistry, electricity, mechanics and heat phenomena were all bound together by the law of conservation of energy.

The; course of this movement continued to support Newton's conviction as to the possibility of deriving all the phenomena of nature from the laws of motion and gravitation. Though evidence was overwhelmingly in favour of the invariable mathematical order of the heavens by the time of Newton's death in 1727. a number of irregularities in the motions of the heavenly bodies were observed and were unaccounted for. These departures from perfect law and order added up to one large question. Is the solar system stable? That is,, would these irregularities, small as they were, gradually increase and by virtue of the complicated effects of the heavenly bodies on each other, tend to unbalance the solar system?

Newton was well aware of many of these irregularities and in his own studies he tackled the motion of the Moon. Newton was convinced that some of them were due to the fact that the Sun as well as the Earth attracts the Moon and causes departures from a truly elliptical path. However, since he had no proof that all the observed irregularities in the motions of the moon and the planets were due to gravitational pulls, and since he could not show that the cumulative effect would not ultimately disrupt the solar system, he felt obliged to call on God's intervention to keep the universe functioning.

But Newton's eighteenth-century successors decided to rely less on God' will and more on their own powers of deduction. Two of the greatest mathematicians of the eighteenth century made phenomenal contributions in the field of Moon motion under the attraction of the Sun and the Earth —the first was the Italian — born J. L. Lagrange and the second —the Frenchman P. S. Laplace.

Lagrange showed that the variation in the portion of the Moon that is visible is caused by the equatorial bulges of both the Earth and the Moon. In addition, the attraction of the Sun and Moon on the Earth-disturbs the Earth's axis of rotation by calculable amount.

Exercises

Exercise 1. Pronounce and remember the following:

Fundamental-асосий; основной

Success-ютук, успех

To discover-кашф этмоқ; открыть

Together-биргаликда, вместе

To attract-жалб этмоқ, привлекать

To decide-қарор қилмоқ, решать

To observe-кузатмоқ, наблюдать

Exercise 2. Form the new words with the help of suffixes. Translate them.

To deduce, similar, to calculate, success, to observe, to add, increase, to attract, to oblige.

Exercise 3. Translate the following into Uzbek or Russian:

To secure, to deduce, satellite, conservation, conviction, evidence, invariable, heavenly, bodies, departure, irregularity, cumulative, ultimately.

Exercise 4. Translate the following into English:

Фан, ҳисобламоқ, осмон жисмлари, қуёш системаси, мураккаб, ой, исбот, ҳисса қўшмоқ, планета, бўлим, таъсир.

Exercise 5. Make up sentences from the following:

1. Galileo, was, the work, and, of, Newton, only, of, a programme, the beginning, science, for.
2. the search, of, the success, extended, laws, for, the field, far beyond, astronomy of.
3. together, binding, soon, separate, laws, science, of, branches, discovered, were.
4. from, departures. These, perfect, and, law, order, up, one, added, to, question, large.
5. system, the solar, stable, is?
6. well, was, aware, Newton, many, of, these, of, irregularities.

Exercise 6. Translate the sentences paying attention to the adverbs:

1. The work of Galileo and Newton was only the beginning of a programme for science.
2. The mass of the sun and the mass of any planet with observable satellites were soon calculated.

3. The success of the search for laws extended far beyond the field of astronomy.
4. Soon laws binding together separate branches of science were discovered.
5. Chemistry, electricity, mechanics and heat phenomena were all bound together by the law of conservation of energy.
6. A number of irregularities in the motions of the heavenly bodies were observed and were unaccounted for.
7. These departures from perfect law and order added up to one large question.
8. But Newton's eighteenth century successors decided to rely less on God will and more on their own powers of deduction.

Exercise 7. Make up some questions the answers of which are the following.

1. The mass of the Sun and the mass of any planet with observable satellites were soon calculated.
2. The success of the search for laws extended far-beyond the field of astronomy.
3. Soon laws binding together separate branches of science were discovered.
4. Chemistry, electricity, mechanics and heat phenomena were all bound together by the law of conservation of energy.
5. The course of this movement continued to support Newton's conviction.
6. A number of irregularities in the motions of the heavenly bodies were observed and were unaccounted for.
7. These departures from perfect law and order added up to one large question.
8. Newton was well aware of many of these irregularities and in his own studies he tackled the motion of the Moon.

Exercise 8. Answer the following questions:

1. Whose work was only the beginning of a programme for science?
2. What was calculated soon?
3. What was discovered soon?
4. What was observed and unaccounted for?
5. Is the solar system stable?
6. What did Newton tackle in his own studies?
7. Who decided to rely less on God's will and more on their own powers of deduction?
8. Who made phenomenal contributions in the field of Moon motion under the attraction of the Sun and the Earth?
9. What did Lagrange Show?
10. Who made phenomenal contributions in the field of Moon motion under the attraction of the Sun and the Earth?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Ill news travel fast.
2. Lost time is never found again.

PART II **BIOLOGY**

Biosynthetic aspects of metabolism

The major questions which must be asked in connection with the biosynthesis of macromolecules by bacteria seem to be, as follows (a) to what extent are the synthesis interdependent? (b) where are the synthetic systems localized in the cell? (c) what determines the sequences of units in the macromolecules? What determines the rates of which the various molecular species are synthesized? Is the current theory of amino-acid activation, followed by transfer to soluble RNA and thence to microsomal particles before being released as soluble protein, applicable to bacteria? The interpretation of amino-acid incorporation has been made more meaningful by the recent recognition of the distinct character of the cell wall. The distinction between incorporation into wall and other protein is particularly evident when cell wall synthesis is blocked. The resulting protoplast is often competent to carry out all the other biosynthetic activities characteristic of living material. Alternatively, cell wall synthesis can occur without the synthesis of other components. Details of the mechanism of cell wall synthesis are now rapidly accumulating.

An outstanding advance has been made in studies of nucleic acid synthesis. Polynucleotides of both ribose and desoxyribose can now be synthesized by purified enzymes. The rate of DNA synthesis by the purified enzyme is sufficient to account for the synthesis of DNA in growing cells. Both the RNA and DNA systems seem to need a «primer» molecule. If primer is shown to act as a template, the enzyme would only be required to facilitate the replication of existing molecules. Such processes seem to satisfy the biological requirements of precise duplication but it remains to be seen whether the products are «natural», and exhibit biological activity. Concurrently, the process of DNA replication in the living cell has been shown to be in accord with the predictions of the Watson-Crick model. The distinction between soluble RNA and the RNA associated with particles has become more widely recognized and methods now available to distinguish the two types. Measurements of RNA synthesis will have more significance when the experiments are designed to permit this distinction. It is quite likely that many of the disturbed systems which allow RNA synthesis may turn out to be producing soluble RNA but not completed ribonucleoprotein particles.

Exercises

Exercise 1. Pronounce and remember the following:

Microsome-микросом

Biosynthesis-биосинтез

Macromolecules-макромолекула

Recognition-признание, узнавание

Separable-отделяемый, отделимый

Segregate- отделять, разделять

Enzyme-фермент

Exercise 2. Form the new words with the help of suffixes. Translate the words.

Connect, active, to recognize, to act, to require, to associate, to measure, to permit, to allow, significance.

Exercise 3. Translate the following into Uzbek or Russian:

Connection, as follows, determine, soluble, segregate, confuse, in detail, enzyme, to associate, fragment, capacity.

Exercise 4. Translate the following into English.

Назария, тараққиёт, сабаб, жойлашмоқ, яқин алоқада бўлмоқ, таъминламоқ, даража, танламоқ, тўла.

Exercise 5. Make up sentences from the following.

1. what, extent, are, to, the, synthesis, interdependent?
2. the synthetic, are, when, localized, systems, the, cell, in?
3. partially, of, a variety, systems, autonomous, have, segregated, been.
4. them, some, of, in, the, detailed, are, mechanisms, quite, understood, well.
5. has, a beginning, made, been, localizing, in, concerned, the enzymes.
6. enzymes, definitely, two, are, in located, the particles.

Exercise 6. Translate the sentences paying attention to the Present Perfect Tense:

1. What determines the rates of which the various molecular species are synthesized?
2. The interpretation of amino-acid incorporation has been made more meaningful by the recent recognition of the distinct character of the cell wall.
3. The distinction between incorporation into wall and other protein is particularly evident when cell wall synthesis is blocked.
4. An outstanding advance has been made in studies of nucleic acid synthesis.
5. Polynucleotides of both ribose and desoxyribose can now be synthesized by purified enzymes.
6. If primer is shown to act as a ten late, the enzyme would only be required to facilitate the replication of existing molecules.
7. Concurrently, the process of DNA replication the living cell has been shown to be in accord with the predictions of the Watson-Crick model.
8. Measurements of R synthesis will have more significance when the experiments are signed to permit this distinction.

Exercise 7. Make up some questions the answers of which are the following.

1. The interpretation of amino-acid incorporation has been made more meaningful by the recent recognition of the distinct character of the cell wall.
2. Cell wall synthesis can occur without the synthesis of other components.

3. Details of the mechanism of cell wall synthesis are now rapidly accumulating.
4. The rate of DNA synthesis by the purified enzyme is sufficient to account for the synthesis of DNA in growing cells.
5. The distinction between soluble RNA and the RNA associated with particles has become more widely recognized and methods now available to distinguish the two types.
6. Measurements of K synthesis will have more significance when the experiments are designed to permit this distinction.
7. It is quite likely that many of the disturbed systems which allow RNA synthesis may turn out to be producing soluble RNA but not completed ribonucleoprotein particles.
8. An outstanding advance has been made in studies of nucleic acid synthesis.

Exercise 8. Answer the following questions.

1. To what extent are the syntheses interdependent?
2. Where are the synthetic systems localized in the cell?
3. What determines the sequences of units in the macromolecules?
4. What determines the rates of which the various molecular species are synthesized?
5. Are the detailed mechanisms quite well understood?
6. What systems have been segregated?
7. What does oxidative phosphorylation seem to be associated with?
8. How many enzymes are definitely located in the particles?
9. How many methods for the control of the rates of reactions in the cell have now been recognized and defined?
10. Is the synthesis of the small molecules quite clearly separable from the synthesis of macromolecules?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Too many cooks spoil the broth.
2. A good beginning makes a good ending.

Nature of the nerve impulse

The mechanism by which signals are rapidly transmitted over long distances in the body has formed one of the principal preoccupations of biophysicists for well over a century since the days of du Bois-Reymond (about 1850) it was known that nerves not only excited by electric current but also produce, in the course of their activity, electric currents of their own. His pupil Hermann suggested that the propagation of a signal along a nerve fiber (or axon) involves a process of recurrent electric stimulation from point to point. Hermann also called attention to the apparent cable properties of nerve fibers, although he recognized that by passive cable transmission alone nerve signals could not travel over any

appreciable length. Later, under the influence of Nernst, Bernstein developed the key of the modern membrane theory. According to Bernstein the key to our understanding of the nerve impulse is to be found in the properties of the surface membrane of the axon, and especially its selective and changeable permeability (or conductance) to ambient ions. His theory has been modified in important details, but essence it still stands, and the advances which have been made in this field during the last two decades have confirmed the usefulness of Bernstein's basic concept.

The view which now has emerged is (a) *that* the electrical events in a nerve fiber are governed by the differential permeability of its surface membrane to sodium and potassium ions, and (b) that these permeabilities themselves depend upon the electric field across the surface. The interaction of these two factors leads at a certain critical threshold level to excitation, that is to a regenerative release of electrical energy from the axon membrane and the propagation of this change along the fiber in the form of brief, all-or-none, electrical impulse (the so-called spike or action potential)

Exercises

Exercise 1. Pronounce and remember the following:

Signal-белги, знак

Biophysicist-биофизик

Propagation-кўпайиш, увеличение

Fiber-тола, волокна

Recurrent-даврий, периодический

Transmission-қайта бериш, переход

Appreciable-қийматли, дорогое

Permeability-ўтказувчанлик, проводимость

Exercise 2. Form the new words with the help of suffixes. Translate the words.

To form, to excite, to produce, electric, to suggest, to transmit, to develop, important, advance, concept, to depend, change.

Exercise 3. Translate the following into Uzbek or Russian:

Rapidly, excited, to suggest, propagation, cable, according to, property, ambient, to confirm, emerge, sodium, potassium ions.

Exercise 4. Translate the following into English.

Масофа, тана, электр токи, нерв (асаб) толаси, ишлаб чиқармоқ, бошқармоқ, билмоқ, танимоқ, эътибор.

Exercise 5. Make up sentences from the following.

1. known, as, nerves, it, that, not, an excited, only, by, current, electric, also, but, procedure, the course, in, the, of, activity.
2. developed, the key, Bernstein, of, membrane, the modern, theory.
3. theory, his, modified, been, in, details, important, has.

4. permeabilities, these, depend, themselves, upon the, field, across, electric, the surface.
5. interaction, the, these, of, factors, two, leads, at, critical, level, to, excitation, threshold.
6. later, the influence, under, of, Nernst, developed, the key, Bernstein, of, membrane, the modern, theory.

Exercise 6. Translate the sentences paying attention to the pronouns:

1. The mechanism by which signals are rapidly transmitted long distances in the body has formed one of the principal preoccupations of biophysicists for well over a century.
2. Since the days of du Bois-Reymond (about 1850) it was known that nerves not only excited by electric current but also produce, in the course of their activity, electric currents of their own.
3. Nernst also called attention to the apparent cable properties of nerve fibers.
4. Later, under the influence of Nernst, Bernstein developed the key of the modern membrane theory.
5. His theory has been modified in important details.
6. The advances which have been made in this field during the last two decades have confirmed the usefulness of Bernstein's basic concept.
7. These permeabilities themselves depend upon the electric field across the surface.
8. The interaction of these two factors leads at a certain critical the threshold level to excitation

Exercise 7. Make up some questions the answers of which are the following.

1. Since the days of du Bois-Reymond it was known that nerves not only excited by electric current but also produce, in the course of their activity, electric currents of their own.
2. Nernst also called attention to the apparent cable properties of nerve fibers.
3. Bernstein developed the key of the modern membrane theory.
4. His theory has been modified in important details.
5. The advances which have been made in this field during the last two decades have confirmed the usefulness of Bernstein's basic concept.
6. According to Bernstein the key to our understanding of the nerve impulse is to be found in the properties of the surface membrane of the axon.
7. The view which now has emerged is that the electrical events in a nerve fiber are governed by the differential permeability of its surface membrane to sodium and potassium ions.
8. These permeabilities themselves depend upon the electric field across the surface.

Exercise 8. Answer the following questions.

1. Are nerves excited by electric current?
2. When do they produce?
3. What did Hermann suggest?
4. Did he also call attention to the apparent cable properties of nerve fibers?
5. What did he recognize?
6. Who developed the key of the modern membrane theory?
7. In what details has his theory been modified?
8. When have the advances been made in this field?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. No sweet without some sweat.
2. Speech is silver, but silence is gold.

Carbohydrates

The carbohydrates are usually defined as substances containing! carbon, hydrogen and oxygen, hydrogen and oxygen being present in the same ratio as in water. Their general formula is, therefore, $C_m(H_2O)_n$.

Although satisfactory for most purposes this definition is not strictly accurate, since some carbohydrates are known in which the proportion of oxygen is lower than that required by the general formula.

The easiest approach to the study of their structure follows from the consideration of all carbohydrates as either hydroxy-aldehyde or hydroxy-ketones. The simpler carbohydrates are known as sugars. Those containing an aldehyde group are known as aldoses, and the simplest of these is hydroxy-acetaldehyde. The aldose sugar containing three carbon atoms is glyceric aldehyde or glycerose.

Ketoses are sugars containing a ketone grouping instead of the aldehyde grouping and the simplest of these is dihydroxy-acetone. Glycerose and dihydroxy-acetone both contain three carbon atoms and are therefore termed trioses. Tetroses contain four carbon atoms, pentoses contain five, and hexoses contain six carbon atoms.

Such simple sugars are also known as monosaccharides.

When two monosaccharide units condense together with the elimination of water, disaccharide is formed; when three condense together the product is trisaccharide; while the product formed by the condensation of a large number of monosaccharide units is known as a polysaccharide.

Exercises

Exercise 1. Pronounce and remember the following:

Carbohydrates-углевод

Hydrogen-водород

Ratio-алюка, связь

Monosaccharide-моносахарид

Substance-материя

Exercise 2. Form the new words with the help of suffixes. Translate the words. To define, present, to require, to consider, to form, product, condense.

Exercise 3. Translate the following into Uzbek or Russian:
Hydrogen, ratio, proportion, carbohydrate, hydroxyl-aldehydes, hydroxyl-ketones, hydroxyl-acetaldehyde, aldoses, glycerose, ketone, dihydroxyacetone, monosaccharide, disaccharide, trisaccharide, polysaccharide.

Exercise 4. Translate the following into English.
Кислород, қониқарли, тузилиш, оддий, шакар, ўрнида, бир қанча, пайдо бўлмоқ, мавжуд бўлмоқ.

Exercise 5. Make up sentences from the following.

1. usually, are, the carbohydrates, defined, substances, as.
2. simpler, the carbohydrates, known, sugars, as, are.
3. containing, those, group, an aldehyde, know, aldoses, as, are.
4. sugar, containing, the aldose, three, atoms, carbon, glyceric, is, aldehyde, glycerose, or.
5. both, contain, glycerose, three, and, atoms, carbon, dihydroxy-acetone.
6. sugars, simple, are, as, known, monosaccharides, such, also.

Exercise 6. Translate the sentences paying attention to the conjunctions:

1. The carbohydrates are usually defined as substances containing carbon, hydrogen and oxygen.
2. Some carbohydrates are known in which the proportion of oxygen is lower than that required by the general formula.
3. The simpler carbohydrates are known as sugars.
4. Those containing an aldehyde group are known as aldoses.
5. The aldose sugar containing three carbon atoms is glyceric aldehyde or glycerose.
6. Retoses are sugars containing a ketone grouping instead the aldehyde grouping.
7. Glycerose and dihydroxy-acetone both contain three carbon atoms and are therefore termed trioses.
8. Such simple sugars are also known as monosaccharides.

Exercise 7. Make up some questions the answers of which are the following.

1. The carbohydrates are usually defined as substances containing carbon, hydrogen and oxygen.
2. Their general formula is, therefore, $C_m(H_2O)_n$
3. The simpler carbohydrates are known as sugars.
4. Those containing an aldehyde group are known as aldoses and the simplest of these is hydroxyl-acetaldehyde.

5. The aldose sugar containing three carbon atoms is glyceric aldehyde or glycerose.
6. Tetroses contain four carbon atoms, pentoses contain five and hexoses contain six carbon atoms.
7. Such simple sugars are also known as monosaccharides.
8. When two monosaccharide units condense together with the elimination of water, disaccharide is formed.
9. When three condense together the product is trisaccharide.
10. While the product formed by the condensation of a large number of monosaccharide units is known as a polysaccharide.

Exercise 8. Answer the following questions.

1. What are the carbohydrates usually defined as?
2. What is their general formula?
3. What are the simpler carbohydrates known as?
4. What is glyceric aldehyde?
5. What is dihydroxy-acetone?
6. How many carbon atoms do glycerose and dihydroxy-acetone contain?
7. How many carbon atoms do tetroses contain?
8. What are simple sugars also known as?
9. When is disaccharide formed?
10. When is trisaccharide formed?
11. What is polysaccharide?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Where there is a will, there is a way.
2. Honesty is the best policy.

Biochemistry of the cell

The generalized plant cell is made up of a thin layer of protoplasm which rounds the large vacuole and which is in turn surrounded by the characteristic wall. From the point of view of cell volume, the vacuole is all important.

Renewed physiologically the vacuole is also doubtless of great significance, particularly as to its osmotic role in the water relations of plant. From the point of dry weight, however, the vacuole is relatively insignificant since its contents are made up so largely of water.

Metabolically also the vacuole is not of that interest since few if any important metabolic processes take place within the portion of the cell. The wall of the plant cell ordinarily makes up a much smaller portion of the total volume than the vacuole, although in certain cases very massive secondary walls may occupy the bulk of the cell lumen. Even in the generalized wall, however, the cell wall

tends to make up a quarter to a half or more of the total weight, and is then the largest single item in the overall cellular constitution. The remaining dry matter of the cell is shared among the components which go to make up the cytoplasm and its inclusions, the nucleus, starch grains, fat droplets, the granules and particularly in the case of the cells of green leaves, the chloroplasts. What now can we say about the chemical compositions and the metabolic functions of these different portions of the plant cell? The cell wall consists primarily of polysaccharides and polysaccharide derivatives (part II), and, although there are a few special cases in which the cell wall is made of largely of a single polysaccharide, still in the more usual case several distinct and different compounds are intimately intermingled in its structure. Pores in its structure permit the ready exchange of smaller molecules, and it is undoubtedly the protoplasmic membrane rather than the cell wall which constitutes the semipermeable barrier in the cell wall. Cell wall constituents are evidently formed by processes which take place in protoplasm, although we have but little evidence on this point. In any case wall once laid down is relatively permanent and its constituents ordinarily reenter the metabolism of the cell sluggishly if at all. The cell wall is however, subject at present to two striking and important transformations, related respectively to cell elongation and to fruit ripening.

Exercises

Exercise 1. Pronounce and remember the following:

Protoplasm-протоплазма

Surround-ўраб олмоқ, окружать

Osmotic-осмотик, осмотичный

Cytoplasm-цитоплазма

Inclusion-ўз ичига олиш, включать в себя

Nucleus-ядро

Chloroplast-хлоропласт

Polysaccharide-кўп сахаридли, полисахаридный

Exercise 2. Form the new words with the help of suffixes. Translate the words. To generalize, important, significance, to occupy, to constitute, distinct, permit, evident, to transform, to relate.

Exercise 3. Translate the following into Uzbek or Russian:

Surround, vacuole, cell, point of view, volume, doubtless, weight, ordinary, total, lumen, membrane, sluggishly, relatively

Exercise 4. Translate the following into English.

Ўсимлик, муҳим, шубҳасиз, жараён, эгалламоқ, ташкил топтомоқ, цитоплазма, бирикмалар, оғирлик (вазн).

Exercise 5. Make up sentences from the following.

1. plant, the generalized, is, cell, made, up, a, thin, of, layer, protoplasm, of.
2. point, from, of, volume, cell, the, view, of, the, vacuole, all, important, is.

3. vacuole, the, relatively, is, since, insignificant, its, contents, made up, so, are, largely, water, of.
4. wall, the, plant, of, the, ordinarily, cell, makes up, much, a smaller, of, the total, portion, volume, than, the vacuole.
5. consists, wall, cell, the, primarily, of, and, polysaccharide.
6. wall, made up, the, cell, is, of, largely, a single polysaccharide.

Exercise 6. Translate the sentences paying attention to the Modal Verb “Can”:

1. The generalized plant cell is made up of a thin layer of protoplasm.
2. From the point of view of cell volume, the vacuole is all important.
3. From the standpoint of dry weight, however, the vacuole is relatively insignificant.
4. The wall of the plant cell ordinarily makes up a much smaller portion of the total volume than the vacuole.
5. What now can we say about the chemical compositions and the metabolic functions of these different portions of the plant cell?
6. The cell wall consists primarily of polysaccharides and polysaccharide derivatives.
7. The cell wall is made up largely of a single polysaccharide.
8. Cell wall constituents are evidently formed by processes which take place in protoplasm.

Exercise 7. Make up some questions the answers of which are the following.

1. The generalized plant cell is made up of a thin layer of protoplasm.
2. From the point of view of cell volume, the vacuole is all important.
3. The wall of the plant cell ordinarily makes up a much smaller portion of the total volume than the vacuole.
4. The remaining dry matter of the cell is shared among the components.
5. The cell wall consists primarily of polysaccharides and polysaccharide derivatives
6. The cell wall is made up largely of a single polysaccharide.
7. Pores in his structure permit the ready exchange of smaller molecules.
8. Cell wall constituents are evidently formed by processes which take place in protoplasm

Exercise 8. Answer the following questions.

1. What is the generalized plant cell made up of?
2. What surrounds the large vacuole?
3. Is the vacuole all important from the point of view of cell volume?
4. When is the vacuole relatively insignificant?
5. What makes up a much smaller portion of the total volume than a vacuole?
6. What does the cell wall consist of?
7. What is cell wall made up of?
8. What are cell wall constituents evidently formed by?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. There is no time like the present.
2. Show me your company and I'll tell you what you are.

Radiation, the cellular approach

The basic biological action of radiation must initially particular cells. The sensitivity of various cells differ but some of the differences may be due to a roserate effect. When cells are irradiated with doses in the lethal range, inhibition of cell division occurs. A notable feature of mitotic inhibition is that it depends not only but on dose rate. Chromosome breaks produced in cells may be a visible manifestation of an interruption in chemical synthesis produced by the passage of ionizing particles. The effect of oxygen is apparently of primary importance in biological changes produced by irradiation. Almost all are decreased in its absence. The current trend in research on the cellular level is towards determining more obscure injuries which cannot be seen under the microscope. Radiation biologists are concerned chiefly with how rays wave lengths outside the visible spectrum can alter a cell, a tissue or an organism. Radio biologic action begins with changes in the atomic structure of cellular constituents. If the component modified is a critical one, radiobiological action is reflected in an altered cell behaviour which has an influence on the organism and the population as a whole.

The basic biological action of radiation must initially involve particular cells. To obtain fundamental information concerning the biological effect of irradiation we must study its effects on isolated cells or cell colonies. It is at the cellular level where we might expect to observe the most direct expression of the radiation response.

Exercises

Exercise 1. Pronounce and remember the following:

Radiation-нурланиш, радиация, облучение

Initially-бошланғич, начальное

Notable-диққатга сазовор, знаменительный

Apparently-аниқ., маълум, точно, известно

Irradiation-иррадиация

Microscope-микроскоп

A tissue-тўқима. Клетка

Exercise 2. Form the new words with the help of suffixes. Translate the words.

Particular, to differ, to effect, to irradiate, to divide, to depend, to produce, to interrupt, important, change, to inform, to observe.

Exercise 3. Translate the following into Uzbek or Russian:

Dose-rates, inhibition, manifestation, tissue, irradiation, obscure, injury, initially, to observe.

Exercise 4. Translate the following into English.

Ҳужайра, фарқ қилмоқ, бўлиниш, боғлиқ бўлмоқ, зарра, бошланғич, таъсир қилмоқ, турли хил, хромосома, пайдо бўлмоқ.

Exercise 5. Make up sentences from the following.

1. basic, action, radiation, the, biological, of, must, particular, initially, cells, involve.
2. sensitively, various, the, cells, of, differs.
3. cells, when, with, are, doses, irradiated, in, range, lethal, of, inhibition, cell, occurs, division, the.
4. depends, only, it, on, but, dose, rate, on, dose, not.
5. action, radio, biological, with, begins, in, changes, the atomic, of, structure, constituents, cellular.
6. biological, basic, the, of, action, must, radiation, initially, particular, involve, cells.

Exercise 6. Translate the sentences paying attention to Modal Verb “Must”:

1. the basic biological action of radiation must initially involve particular cells.
2. The sensitivity of various cells differs but some of the differences may be due to a roserate effect.
3. Chromosome breaks produced in cells may be a visible manifestation of an interruption in chemical synthesis produced by the passage of ionizing particles.
4. The current trend in research on the cellular level is towards determining the more obscure injuries which cannot be seen under the microscope.
5. Radiation biologists are concerned chiefly with how rays of wave lengths outside the visible spectrum can alter a cell, a tissue or an organism.
6. The basic biological action of radiation must initially involve particular cells.
7. To obtain fundamental information concerning the biological effect of irradiation we must study its effects on isolated cells or cell colonies.
8. It is at the cellular level where we might expect to observe the most direct expression of the radiation response.

Exercise 7. Make up some questions the answers of which are the following.

1. The basic biological action of radiation must initially involve particular cells.
2. When cells are irradiated with doses in the lethal range, inhibition of cell division occurs.
3. A notable feature of mitotic inhibition is that it depends not only in dose but on dose rate.

4. The effect of oxygen is apparently of primary importance in biological changes produced by irradiation.
5. Radiobiological action begins with changes in the atomic structure of cellular constituents.
6. If the component modified is a critical one, radiobiological action is reflected in altered cell behaviour.
7. The basic biological action of radiation must initially involve particular cells.
8. To obtain fundamental information concerning the biological effect of irradiation we must study its effects on isolated cells or cell colonies.

Exercise 8. Answer the following questions.

1. What must basic biological action of radiation initially involve?
2. Does the sensitivity of various cells differ?
3. When does inhibition of cell division occur?
4. What does a notable feature of mitotic inhibition depend on?
5. What is apparently of primary importance in biological changes?
6. What is radiation biologists concerned with?
7. What does radiobiological action begin with?
8. What must we study to obtain fundamental information concerning the biological effect of irradiation?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Healthful habits make healthy bodies.
2. Out of sight, out of mind.

Behaviour of excised leaves

The leaf is the great laboratory of the plant and contains a v array of chemical mechanisms for syntheses of the most varied character. Among the metabolic activities of leaves which are read available for study, the changes in nitrogenous compounds are standing and a vast amount of effort has gone into studies of changes in the levels of the various nitrogen fractions in leaves subjected to varying environmental conditions. The nitrogen metabolism of excised leaves in particular has been subjected to such a study Schulze first performed such experiments and found that in excised leaves, kept in the dark with their petioles in water, protein is hydrolyzed and asparagine accumulated much as in seedlings. Similar results have been obtained by many other workers with a variety of species as for example by Chibnall and Mothes with leaves of Phaseolus and Vicia. In excised leaves protein is hydrolyzed and amides and amino-acids accumulate. Such changes in constitution would not ordinarily have taken place had the leaves remained attach to the plant, in which case the protein level remains relatively constant as will be discussed below. That protein hydrolysis takes place both in

dark, where the leaves are depleted of reserves, and light, where photosynthetic formation of carbohydrate may occur indicated that protein breakdown is caused primarily by excision rather than by starvation of the leaf.

A major portion of nitrogen liberated during protein hydrolysis of the excised leaf may appear as amide nitrogen. This accumulation of amide must be owing to secondary synthesis of the substance since only relatively small amounts of amides are contained in the leaf protein. Mothes was among the first to study conditions governing amide synthesis in excised leaves, particularly with the hope of discovering the nature of the carbon skeleton” from which asparagine is formed. He infiltrated leaves with various compounds structurally related to asparagine, such as ammonium aspartate and ammonium succinate, and found that all these substances cause large increases in asparagine, the infiltrate ammonia being almost quantitatively transformed to amide. There is no evidence however, that the carbon compounds supplied are actually used in asparagine synthesis, and in fact infiltration with ammonium sulfate is as effective as are ammonium salts of four-carbon acids. It would appear then that the carbon skeleton for amide synthesis is already present in the tissue or in any case can be readily formed from an endogenous source and that both atoms of the amide formed are derived from the ammonium supplied. It remained for Chibnall to demonstrate that amide is indeed formed from such an endogenous precursor.

Exercises

Exercise 1. Pronounce and remember the following:

Synthesis-синтез

Nitrogenous-азотли, азотный

Environmental-атроф-муҳит, среда

Accumulate-йиғмоқ, накапливать

Starvation-очлик, голод

Amides-аминогурух, аминокгруппа

Endogenous-ички қават, внутренний слой

Exercise 2. Form the new words with the help of suffixes. Translate the words. Change, environment, particular, to accumulate, to discuss, reserve, to liberate, to appear, to transform, to infiltrate, to effect, to derive, to demonstrate.

Exercise 3. Translate the following into Uzbek or Russian:

A vast array, available, subjected to, varied, in any case, evidence, asparagines, succinate, substance, amide, increase, to cause, primarily, to occur, petiole.

Exercise 4. Translate the following into English.

Кимёвий механизм, орасида, фаолият, ўхшаш, бирикма, атроф-муҳит, айниқса, ўзгаришлар, табиат, кўрсатмоқ, мавжуд бўлмоқ.

Exercise 5. Make up sentences from the following.

1. great, the, is, the leaf, laboratory, the plant, of.

2. contains, a vast array, the leaf, chemical, mechanism, of, synthesis, for, varied, the most, character, of.
3. changes, the, nitrogenous, compounds, in, are, outstanding.
4. nitrogen, of, the, metabolism, excised, in particular, leaves, been, to, such, has, a study, subjected.
5. much, performed, Schulze, experiments, first.
6. results, obtained, similar, have, by, been, many, workers, other.

Exercise 6. Translate the sentences paying attention to Modal Verb “May”:

1. Among the metabolic activities of leaves which are read available for study.
2. The nitrogen metabolism of excised leaves in particular has been subjected to such a study.
3. Similar results have been obtained by many other workers with a variety of species.
4. In excised leaves protein is hydrolyzed and amides and amino-acids accumulate.
5. A major portion of nitrogen liberated during protein hydrolysis of the excised leaf may appear as amide nitrogen.
6. This accumulation of amide must be owing to secondary synthesis of the substance.
7. It would appear then that the carbon skeleton for amide synthesis is already present in the tissue or in any case can be readily formed from an endogenous source.
8. Both atoms of the amide formed are derived from the ammonium supplied.

Exercise 7. Make up some questions the answers of which are the following.

1. The leaf is the great laboratory of the plant and contains a vast array of chemical mechanisms for synthesis of the most varied character.
2. The nitrogen metabolism of excised leaves in particular has been subjected to such a study.
3. Schulze first performed such experiments.
4. He found that in excised leaves kept in the dark with their petioles in water, protein is hydrolyzed and asparagines accumulated much as in seedlings.
5. Similar results have been obtained by many other workers with a variety of species.
6. In excised leaves protein is hydrolyzed and amides and amino-acids accumulate.
7. Both atoms of the amide formed are derived from the ammonium supplied.
8. The carbon compounds supplied are actually us in asparagines synthesis.

Exercise 8. Answer the following questions.

1. What is the leaf?
2. What does the leaf contain?
3. What changes are outstanding among the metabolic activities of leaves which are readily available for study?

4. Who first performed such experiments?
5. What did Schulze find?
6. What is hydrolyzed in excised leaves?
7. Who was among the first to study conditions governing amide synthesis in excised leaves?
8. Whom have similar results been obtained by?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. A word to the wise is enough.
2. A stitch in time saves nine.

Molecular set theory

It is possible that a living organism conditions can be so regulated that even multimolecular reaction chains non-exactness, as in unimolecular case, becomes the most probable sequential mechanism. Very fast reaction rates, biological molecules of very high specificity, etc., could militate to bring about such a highly ordered system. In terms of the biochemical aspects of heredity and development chains of biochemical reactions of the non-exact type would promote the direct transference and preservation of hereditary characteristics carried by the original molecules in the chain. The idealized assumption of the indistinguished ability of molecules of a given species would be an argument against such a rationale. However, of particular pertinence here is the discovery made by DR. Wacker and Dr. Vallee (1959) in this laboratory that RNA from various sources contains significant amounts of firmly bound metals: magnesium, calcium, strontium, barium, aluminium, chromium, manganese, iron, nickel, copper and zinc. This finding correlates with previous finding that ribonucleoprotein contained large amounts of the same metals. These investigators state: «These elements have not heretofore been found to be aggregated to this extent in any other biological material; this supports the postulated specificity of interaction between metals and RNA. Since ribonucleic acids are known to be homogeneous further purification may result in the Isolation of ribonucleic acids which contain only one specific metal. While the role of metals in these complex molecules] has not been elucidated as yet, it is possible that their association with metals imposes a distinguishability on the molecules, preserved in the chain of reactions in which they are involved. Such findings are already being examined in relation to the transmission of genetic information and protein synthesis. Thus, it is possible that by various chemical and physical agents a distinguishability may be induced on seemingly homogeneous population of molecules of a given species, lending functional significance (in the biological sense) to some of the finer distinctions.

Exercises

Exercise 1. Pronounce and remember the following:

Non-exactness-ноаниклик, неточность

Sequential-кетма-кет, поочередно

Heredity-мерос, наследство
Assumption-ўзига қабул қилиш, воспринимать
Rationale-асосий сабаб, основная причина
Pertinence-алоқа, связь
Manganese-марганец
Correlate-алоқада бўлмоқ, БЫТЬ В СВЯЗИ

Exercise 2. Form the new words with the help of suffixes. Translate the words.
To regulate, to militate, to develop, to promote, direct, preserve, significant, to investigate, state, to examine, to relate, possible.

Exercise 3. Translate the following into Uzbek or Russian:
To militate, heredity, to promote, preservation, transfer, homogenous, to induce, rate, to involve, to impose, purification.

Exercise 4. Translate the following into English.
Муҳофаза қилиш, қобилият, кашфиёт, манба, миқдор, темир, мис, рух, ихтирочи, ўз ичига олмақ.

Exercise 5. Make up sentences from the following.

1. organism, a living, can, conditions, be, regulated.
2. reaction, chains, multi molecular, non-exactness, the most, probable, becomes, mechanism, sequential.
3. hereditary, preservation, of, carried, characteristics, the original, by, chain, in, the molecules, is.
4. finding, this, with, correlates, finding, previous.
5. contained, amounts, rib nucleoprotein, large, of, the, metals, same.
6. acids, known, ribonucleic, are, homogenous, be, to.

Exercise 6. Translate the sentences paying attention to the Degrees of Adjectives.

1. It is possible that a living organism conditions can be so regulated that even multi molecular reaction chains non-exactness, as in uni molecular case, becomes the most probable sequential mechanism.
2. Biological molecules of very high specificity, etc. could militate to bring about such a highly ordered system.
3. This findings correlates with previous finding that rib nucleoprotein contained large amounts of the same metals.
4. Since ribonucleic acids are known to be homogeneous further purification may result in the isolation of ribonucleic acids which contain only one specific metal.
5. The role of metals in these complex molecules has not been elucidated yet.
6. It is possible that their association with metals imposes a distinguish ability on the molecules.
7. Such findings are already being examined in relation to the transmission of genetic information and protein synthesis.

8. Thus, it is possible that by various chemical and physical agents a distinguish ability may be induced on seemingly homogenous population of molecules of a given species.

Exercise 7. Make up some questions the answers of which are the following.

1. It is possible that a living organism conditions can be so regulated.
2. In terms of the biochemical aspects of heredity and development chains of biochemical reactions of the non-exact type would promote the direct transference.
3. The idealized assumption of the undistinguished ability of molecules of a given species would be an argument against such a rationale.
4. This finding correlates with previous finding that rib nucleoprotein contained large amounts of the same metals.
5. Ribonucleic acids are known to be homogenous.
6. The role of metals in these complex molecules has not been elucidated yet.
7. It is possible that their association with metals imposes a distinguish ability on the molecules.
8. Such findings are already being examined in relation to the transmission of genetic information and protein synthesis.

Exercise 8. Answer the following questions.

1. Can a living organism conditions be regulated?
2. What would in terms of the biochemical aspects of heredity and development chains of biochemical reactions of the non-exact type promote?
3. What did rib nucleoprotein contain?
4. What are rib nucleic acids?
5. What do rib nucleic acids contain?
6. Has the role of metals in these complex molecules been elucidated?
7. What does their association with metals impose?
8. Are such findings already being examined in relation to the transmission of genetic information and protein synthesis?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Let the sleeping dog lie.
2. A penny saved is a penny gained.

Gene action

Further studies of amino-acid sequences of mutant proteins in specific systems will undoubtedly provide answers to such questions as: (a) Is there a direct linear correspondence between mutational sites on a genetic map and the amino-acid sequence of a protein? (b) Is specific information for the folding of a protein contained in gene, or is folding entirely determined by the amino-acid sequence? c) Can alterations in the sequence of its amino-acids affect the rate of synthesis of a

protein and account or observed qualitative affects? d) What is the composition of the «wild type-like» product of complimentation and is a doubly-defective protein produced? (e) Do suppressor genes alter the primary structure of the proteins they effect?

Many related and equally important problems must be solved, however, before a complete understanding of all aspects of gene function in the complex environment of a growing, developing and evolving organism is achieved. The coding problem is basic to further progress in the determination of nucleotide-amino-acid relationships and to a more satisfactory description of genie structure. It appears to be possible that the nucleotide sequences of amino-acid specific, soluble RNA's can be analyzed, and this will certainly contribute deciphering the code. It is to be hoped that chemical mutagens of extreme specificity will enable the investigator to modify mutational patterns at will and to follow the effects of mutation on amino-acid sequence. It may be that as more examples of amino-acid substitutions accumulate at specific sites in proteins in different individuals or different species, some aspects of the code will be re-paled. Certain proposed codes predict a large class of «nonsense» mutations, and the CRM-less mutations warrant additional attention as possible representatives of this class.

It is, of course, that the determination of gene-protein relation-Ps is a function of the types of mutants which are recovered. For this reason, the problem of the so-called «irreparable» mutants of *N crassa* is of great importance. It has been shown that the majority of spontaneous mutants are of this class. Until the nature of the mutations is better understood, the possibility exists that only certain types of genie activity are represented in the systems which have been studied. A third category of genie activities involves genie interactions. Studies on repression of enzyme formation, on associated inducer concentrating systems,, and on the expression of alternate states will undoubtedly continue to provide information concerning the integration of functions within the cell. Current concepts provide few clues to the nature of position effect or to the mode of action of mutation genes, and these subjects warrant considerable additional attention. Finally, the nature of gene-protein relationship during development is an important and puzzling aspect of gene action. An enormous body of information accumulated in recent years indicates that in higher organisms the simplicity of the gene-protein relationship which typifies microbial systems is replaced by complexity at t protein level; a multitude of functionally similar but detectably different forms of the same protein have been demonstrated in different tissues in the „same individual and, in some cases, in the same tissue. It is, of course, possible that the basic relationship of gene to protein is preserved in higher organisms and that macromolecular interaction and regulatory mechanisms, not well understood at the present time, play a more important role. Progress in the elucidation the gene-protein relationships in the last few years has been so rap: and the prospects for -the near future are so encouraging that it probable that such more complex aspects of relationship will so yield to experimental attack.

Exercises

Exercise 1. Pronounce and remember the following:

Amino-acid-аминокислота
Provide-таъминламоқ, обеспечивать
Genetic-генетик. генетический
Account-ҳисоб,счет
Important-муҳим,важный
Complete-бутунлай, тўла, полностью
Environment-атроф-муҳит, среда
Activity-фаолият, деятельность
Additional-қўшимча, дополнительный
Macromolecular-макромолекуляр

Exercise 2. Form the new words with the help of suffixes. Translate the words.
Complex, relation, to determine, to alter, account, product, to develop, to achieve, to describe, mutation, to accumulate.

Exercise 3. Translate the following into Uzbek or Russian:
Mutant, undoubtedly, protein, alteration, complementation, primary, to involve, nucleotide, mutagen, to modify, to propose, warrant, representative, majority.

Exercise 4. Translate the following into English.
Синтез, ўз ичига олмоқ, алоқада бўлмоқ, мураккаб, асосий, пайдо бўлмоқ, текширувчи (изланувчи), ривожланиш, ўхшаш, шубҳасиз, намойиш этмоқ.

Exercise 5. Make up sentences from the following.

1. related, equally, and, many, important, must, problems, solved, be.
2. problem, basic, to further, as, the coding, progress, the determination, in, nucleotide, amino-acid, of, relationships.
3. aspects, the code, will, re-paled, be, of, some.
4. proposed, predict, certain, codes, a large, of, class, mutations, “nonsense”.
5. gene-protein, of, the determination, relation-Ps, a function, of, is, the types, mutants, of, are, which, recovered.
6. the problem, of, the so-called, mutants, *N crassa*, of, “irreparable”, is, great, of, importance.
7. shown, been, it, that, has, the majority, spontaneous, are, mutants, of, class, this, of.
8. category, genie, a third, of, involves, activities, interactions, genie.

Exercise 6. Translate the sentences paying attention to the Future Indefinite Tense.

1. Many related and equally important problems must be solved.
2. Soluble RNA's can be analyzed and this will certainly contribute deciphering the code.
3. Some aspects of the code will be re-paled.

4. It is, of course, the determination of gene-protein relation-Ps is a function of the types of mutants which are recovered.
5. It has been shown that the majority of spontaneous mutants are of this class.
6. Until the nature of the mutations is better understood, the possibility exists that only certain types of genie activity are represented in the systems which have been studied.
7. Microbial systems are replaced by complexity at the protein level.
8. It is, of course, possible that the basic relationship of gene to protein is preserved in higher organisms.

Exercise 7. Make up some questions the answers of which are the following.

1. A complete understanding of all aspects of gene function in the complex environment of a growing, developing and involving organism is achieved.
2. The coding problem is basic to further progress.
3. The CRM-less mutations warrant addition attention as possible representations of this class.
4. It has been shown that the majority of spontaneous mutants are of this class.
5. The nature of the mutations is better understood.
6. Only certain types of genie activity are represented in the systems which have been studied.
7. Current concepts provide few clues to the nature of position effect.
8. The nature of gene-protein relationship during development is an important and puzzling aspect of gene action.

Exercise 8. Answer the following questions.

1. What problems must be solved?
2. What organism is achieved?
3. What is basic further progress in the determination of nucleotide amino-acid relationships?
4. What problem is of great importance?
5. Is the nature of the mutations better understood?
6. What does a third category of genie activities involve?
7. What is an important and puzzling aspect of gene action?
8. What does an enormous body of information accumulated in recent years indicate?
9. What is preserved in higher organisms?
10. What plays a more important role at the present time?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Every bird likes its own nest.
2. A tree is known by its fruit.

Regulation of protein level in leaves

It has been shown that in the germination of the seed, reserve protein is hydrolyzed, the resulting amino-acids translocated, in part transformed, and finally resynthesized to protein in the seedlings. The leaf is similarly an active site of protein synthesis in the intact plant. We might ask then what are the factors which govern the protein level in leaves. In the normal plant, provided that available nitrogen is not limiting in amount, the leaf protein content is maintained at a relatively constant value over long periods of time. This is shown, for example, by the nearly equal protein concentrations found in successive leaves of barley, tobacco, and many other species. The protein nitrogen level in barley, for example varied in our experiment, from 3.23% in the youngest leaves to 4.06% in a mature leaf and 2.52% in the oldest leaves. The decrease in concentration in the older leaves may be due in part to dilution of the protein by increasing amounts of cellulose and other inert materials; in part it no doubt reflects withdrawal of nitrogen to more actively growing centers. In nitrogen deficient plants, on the other hand, the protein level while high in the young leaves is in general progressively lower in the progressively older leaves. In the nitrogen deficient plant, the individual leaf loses protein as it matures, the soluble nitrogen being transported to the actively growing regions. Walkley has followed the diminution of protein in leaves of nitrogen-deficient barley plants, a particular leaf, the fourth, being analyzed periodically from the time of maturity onward over a period of twenty days; protein content of this leaf dropped from 1.82% to 0.19%, a decrease of nearly ten-fold. These leaves are, however, entirely capable of protein synthesis, since when nitrogen was added to the nitrogen-deficient plant, protein was rapidly synthesized to a high level. Similar results have been obtained with cotton. These and a wealth of other investigations show that nitrogen supply is a primary factor regulating protein level in the leaf of the intact plant. It is not, however the sole factor as will be shown below.

Diurnal fluctuations in protein level of the leaf have been observed by several workers. These fluctuations are small and, if present, consist of loss of protein at night and gain of protein by day, their magnitude and nature depending on the age of the leaves employed. Young leaves increase in protein continuously, while old or senescent leaves lose protein continuously, especially under nitrogen deficiency. Only mature but not old leaves show the typical diurnal variation. Exposure of leaves on the intact plants to periods of prolonged darkness include more extensive protein loss than is found during a single night. In this case also protein hydrolyzed and soluble nitrogenous compounds transported from the leaf to other tissues.

Exercises

Exercise 1. Pronounce and remember the following:

Plant-ўсимлик, растение

Amount-миқдор, количество

Relatively-нисбатан, относительно

Value-қиймат, цена

Decrease-пасайиш, уменьшение

Doubt-шубҳа, сомнение

Investigation-текшириш, проверка

Supply-таъминламоқ, обеспечивать

Compound-бирикма, соединение

Exercise 2. Form the new words with the help of suffixes. Translate the words. Reserve, active, value, equal, success, experiment, nature, particular, to add, to investigate, supply, to observe.

Exercise 3. Translate the following into Uzbek or Russian:

Germination, seed, intact plant, nitrogen, cellulose, withdrawal, deficient plant, diminution, diurnal, fluctuation, magnitude, soluble, senescent, variation.

Exercise 4. Translate the following into English.

Натижа, синтез, ҳажм, таъминламоқ, чегараланган, тенг, тажриба, тушмоқ (пасаймоқ), қабул қилмоқ. кузатмоқ, ташкил топмоқ

Exercise 5. Make up sentences from the following.

1. similarly, is, an active, the leaf, site, synthesis, of, in, protein, plant, the intact.
2. ask, might, then, we, what, the factors, are, govern, which, level, the protein, in leaves.
3. followed, of, Walkley, has, protein, the diminution, in, nitrogen, deficient, of, leaves, barley, plants.
4. leaves, however, are, these, capable, entirely, protein, synthesis, of.
5. was, synthesized, protein, rapidly, a high, to, level.
6. fluctuations, small, these, are.
7. leaves, in, continuously, protein, increase, young.
8. leaves, lose, senescent, continuously, protein.

Exercise 6. Translate the sentences paying attention to the Present Indefinite Tense.

1. The leaf is similarly an active site of protein synthesis in the intact plant.
2. We might ask then what factors which govern the protein level in leaves are.
3. In the nitrogen deficient plant, the individual leaf loses protein as it matures.
4. These leaves are, however, entirely capable of protein synthesis.
5. These and a wealth of other investigations show that nitrogen supply is a primary factor regulating protein level in the leaf of the intact plant.
6. These fluctuations are small and consist of loss of protein at night.
7. Young leaves increase in protein continuously.
8. Only mature but not old leaves show the typical diurnal variation.

Exercise 7. Make up some questions the answers of which are the following.

1. The leaf is similarly an active site of protein synthesis in the intact plant.
2. Walkley has followed the diminution of protein in leaves of nitrogen deficient barley plants.
3. Protein content of this leaf dropped from 1,82 % to 0, 19%.
4. Protein was rapidly synthesized to a higher level.

5. Similar results have been obtained with cotton.
6. Young leaves increase in protein continuously.
7. Senescent leaves lose protein continuously.
8. Only mature but not old leaves show the typical diurnal variation.

Exercise 8. Answer the following questions.

1. Is the leaf similarly an active site of protein synthesis in the intact plant?
2. What does the individual leaf lose in the nitrogen deficient plant?
3. Who has followed the diminution of protein in leaves of nitrogen deficient barley plants?
4. What was rapidly synthesized to a high level when nitrogen was added to the nitrogen-deficient plant?
5. What have similar results been obtained with?
6. What do other investigations show?
7. What is a primary factor regulating protein level in the leaf of the intact plant?
8. What leaves increase in protein continuously?
9. What leaves lose protein continuously?
10. What leaves show the typical diurnal variation?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Health is above wealth.
2. An hour in the morning is worth two in the evening.

Nitrogen metabolism of leaves

It has frequently been suggested that protein hydrolysis may be controlled simply by the protein-amino acid ratio prevails in the tissue — a notion derived from the idea that laws of mass action should be applicable to protein synthesis. This view is supported by Phillis and Mason who grew cotton under a wide variety of nutritional and environmental conditions. Analysis of protein and soluble nitrogen in the leaves of plants from these “many different conditions showed a close relation between the two quantities high soluble nitrogen being correlated with high protein level over a considerable range. This correlation striking as it is, and though it has been found by other modern workers, still cannot make immediately explicable certain results already discussed, as for example the high amino-acid level of low potassium barley plants, or the accumulation of amino-acids at the expense of protein in excised leaves of tobacco, barley and other species. A suggestion as to the basis of such discrepancies in the amino-acid-protein relationship is offered by the work of Wood and Cruichshank, who have shown that in starved leaves the individual amino-acids liberate by protein hydrolysis are not stable in cytoplasm, but are remove from the hydrolysate at differing rates. ‘During incubation of excise leaves the amounts of free cystine, glutamic acid, arginine, tyrosine and of tryptophane in the cytoplasm rise each to its individual maximum only to fall again, indicating release and reutilization or destruction of each amino-acid. Furthermore, the amount of each amino-acid

recovered was found to be less than that contains in the amount of protein hydrolyzed. Such secondary removal of amino-acids results in a disproportionality in composition between the free amino-acids of the cytoplasm and the amino-acids in the protein. Cystine in particular, even though it is contained in the leaf protein hydrolyzed by the starving leaf, does not accumulated at all in the products of hydrolysis, and an “equivalent amount of inorganic sulfate appears in its place.

Exercises

Exercise 1. Pronounce and remember the following:

Condition-шароит, условие

Relation-алоқа, связь

Quantity-миқдор, количество

To discuss-муҳокама қилмоқ, обсуждать

Cytoplasm-цитоплазма

To contain-ўз ичига олмоқ, содержать

Data-маълумот, сведения

To appear-пайдо бўлмоқ, появляться

To limit-чегараланмоқ, ограничиваться

Exercise 2. Form the new words with the help of suffixes. Translate the words.

To suggest, condition, to consider, to correlate, to discuss, to differ, to appear, concentrate, present, to limit.

Exercise 3. Translate the following into Uzbek or Russian:

Frequently, to suggest, tissue, applicable, nutritional, soluble, hydrolysate, incubation, cystine, glutamic acid, arginine, tyrosine, tryptophane, aspartic acid, hydrolysis, equilibrium.

Exercise 4. Translate the following into English.

Назорат қилмоқ, оддий, келиб чиқмоқ, ғоя (фикр), шу заҳотиёқ, цитоплазма, кўрсатмоқ, айниқса.

Exercise 5. Make up sentences from the following.

1. supported, view, is, this, Phillis, by.
2. found, been, other, by, has, it, workers, modern.
3. leaves, starved, the individual, in, amino-acids, by liberate, hydrolysis, protein, not, stable, in, cytoplasm, are.
4. each, the amount, of, recovered, amino-acid, was, to be, less, found, than, contains, that, the amount, of, protein, in, hydrolyzed.
5. contained, is, in, it, protein, the leaf, hydrolyzed, leaf, the starving, by.
6. amount, inorganic, an equivalent, of appears, sulfate, its, place, in.
7. small, each, in, amounts, case, amino-acids, of, liberated, are, initially.
8. amino-acids, in, some, appear, the cytoplasm, larger, amounts in.

Exercise 6. Translate the sentences paying attention to the phrases.

1. This view is supported by Phillis and Masson.
2. This correlation striking as it is, and though it has been found by other modern workers.
3. A suggestion as to the basis of such discrepancies in the amino-acid-protein relationship is offered by the work of Wood and Cruichshank.

4. The amount of each amino-acid recovered was found to be less than that contains in the amount of protein hydrolyzed.
5. It is contained in the leaf protein hydrolyzed by the starving leaf.
6. In each case small amounts of amino-acids are liberated initially.
7. This is true, for example, of aspartic acid which must then be synthesized during protein hydrolysis.
8. In general, protein level may be limited by particular amino-acid rather than by total amino-acid level.

Exercise 7. Make up some questions the answers of which are the following.

1. This view is supported by Phillis and Masson.
2. Analysis of protein and soluble nitrogen in the leaves of plants from these many different conditions showed a close relation between the two quantities high soluble nitrogen being correlated with high protein level over a considerable range.
3. This correlation striking as it is, and though it has been found by other modern workers.
4. The amount of each amino-acid recovered was found to be less than that contains in the amount of protein hydrolyzed.
5. In each case small amounts of amino-acids are liberated initially.
6. Some amino-acids appear in the cytoplasm in larger amounts than those present in the hydrolyzed protein.
7. In this way, according to Wood, a given protein level may be in equilibrium with varying total amino-acid levels.
8. The most critical amino-acids appear to be cystine, glutamic acid, arginine, tyrosine and tryptophane, in this order.

Exercise 8. Answer the following questions.

1. What has frequently been suggested?
2. Whom is this view supported by?
3. What did analysis of protein and soluble nitrogen in the leaves of plants from these many different conditions show?
4. Whose work is the amino-acid-protein relationship offered by?
5. What is contained in the leaf protein hydrolyzed by the starving leaf?
6. What appears in its place?
7. What appears in the cytoplasm in large amounts than those present in the hydrolyzed protein?
8. What must be synthesized during protein hydrolysis?
9. May a given protein level be in equilibrium with varying total amino-acid levels according to Wood?
10. May protein level be limited by particular amino-acid rather than by total amino-acid level?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Wealth is nothing health.
2. Keep your mouth shut and your ears open.

PART-III **MATHEMATICS**

Algebra

Algebra is a branch of mathematics concerning the study of structure, relation and quantity. The name is derived from the treatise written by the Persian mathematician, astronomer, astrologer and geographer, Muhammad bin Musa al-Khorazmi titled *Kitab aj-Jabr wa-l-Muqobala* (meaning “The Compendious Book on Calculation by Completion and balancing”), which provided symbolic operations for the systematic solution of linear and quadratic equations. Algebra which treats with the properties of numbers means of letter and symbols. Algebra is mainly concerned with addition, subtraction, evolution, equations, radicals, logarithms and so on. Together with geometry, analysis, combinatorics and number theory, algebra is one of the main branches of mathematics. Elementary algebra is often part of the curriculum in secondary education and provides an introduction to the basic ideas of algebra, including effects of adding and multiplying numbers, the concept of variables, definition of polynomials, along with factorization and determining their roots.

Algebra is much broader than elementary algebra and can be generalized. In addition to working directly with numbers, algebra covers working with symbols, variables and set elements. Addition and multiplication are viewed as general operations and their precise definitions lead to structures such as groups, rings and fields.

Exercises

Exercise 1. Pronounce and remember the following:

Algebra-алгебра

Mathematics-математика

Algebraic-алгебраик, алгебраическое

Branch-тармоқ, ветвь

Structure-тузилиш, структура

Relation-алоқа, отношение

Quantity-сон, миқдор, количество

Radical-илдиз ишораси, знак корня

Solution-ечим, решение

Elementary-оддий, элементарный

Exercise 2. Form the new words with the help of suffixes. Translate the words.
To make, to organize, to divide, to respect, ordinary, general, particular, simple.

Exercise 3. Translate the following into Uzbek or Russian:

To deal with, may be computed, instead of, variables, let, the number 20 be replaced, linear, quadratic equations, combinatorics, number theory, polynomials.

Exercise 4. Translate the following into English.

Мураккаб, куб, элемент, сон, белги, йиғинди, ечмоқ, номаълум, миқдор, усул, амаллар, илдиз ишораси, қўшилиши керак бўлган сон.

Exercise 5. Make up sentences from the following.

1. mathematics, algebra, of, a branch, is.
2. use algebra, doctors, engineers, and scientists, in their research, work.
3. of arithmetic, is, algebra, a generalization.
4. with numbers, and, is concerned, arithmetic, numerical calculations.
5. an algebraic expression of, is called, of one term, a monomial, or simple, expression.
6. more than one term, an algebraic expression of, a polynomial, is called.

Exercise 6. Translate the sentences paying attention to the Modal Verbs.

1. The origins of algebra can be traced to the ancient Babylonians, who developed an advanced arithmetical system with which they were able to do calculations in an algebraic fashion.
2. They were able to apply formulas and calculate solutions for unknown values for a class of problems typically solved today by using linear equations and quadratic equation.
3. Algebra is much broader than elementary algebra and can be generalized.
4. By the use of algebra we can reduce complex problems to simple formulas.
5. We can find the answer to problems about the Universe, and problems of sewing, building, cooking, measuring, buying and selling as well.
6. The skilled worker may use algebra to determine the location of the centre or the size of holes he must drill.

Exercise 7. Make up some questions the answers of which are the following.

1. Algebra is a branch of mathematics.
2. The word “algebra” is named after Arabic word “al-jabr” by the Persian Mathematician Muhammad ibn Musa al-Horazmi in 820.
3. Omar Hayyam developed algebraic geometry and found the general geometric solution of the cubic equation.
4. Algebraic expressions consisting of more than one term are called multinomials.
5. Algebra is a generalization of arithmetic.
6. Algebra is the system of rules concerning the operations with numbers.

Exercise 8. Answer the following questions.

1. What is algebra?
2. What is the relationship between arithmetic and algebra?
3. May algebra be divided categories?
4. Into how many groups are algebraic expressions divided?
5. What is monomial algebraic expression?

6. By what is a monomial represented?
7. What algebraic expression is called polynomial?
8. What are terms of a polynomial?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. A woman's work is never done.
2. Time and tide wait no man.

Elementary algebra

Elementary algebra is the most basic form of algebra. It is taught to students who are presumed to have no knowledge of mathematics beyond the basic principles of arithmetic. In arithmetic, only numbers and their arithmetical operations (such as +, -,) occur. In algebra, numbers are often denoted by symbols (such as a , x , or y). This is useful because:

- It allows the general formulation of arithmetical laws (such as $a+b=b+a$ for all a and b), and thus is the first step to a systematic exploration of the properties of the real number system.
- It allows the reference to “unknown” numbers, the formulation of equations and the study of how to solve these (for instance, “Find a number x such that $3x + 1 = 10$ ”).
- It allows the formulation of functional relationships (such as “If you sell x tickets, then your profit will be $3x - 10$ dollars, or $f(x) = 3x - 10$, where f is the function, and x is the number to which (the function is applied.”). an algebraic expression of one term is called a monomial or simple expression. An algebraic expression of more than one term is called a polynomial; a polynomial of two terms is called a binomial. $3a+2b$ and x^2-y^2 are binomials. $a+b+c$ is a trinomial.

A polynomial is an expression that is constructed from one or more variables and constants, using only the operations of addition, subtraction, and multiplication (where repeated multiplication of the same variable is standardly denoted as exponentiation with a constant positive whole number exponent). For example, x^2+2x-3 is a polynomial in the single variable x .

An important class of problems in algebra is factorization of polynomials, that is, expressing a given polynomial as a product of other polynomials. The example polynomial above can be factored as $(x-1)(x+3)$. A related class of problems is finding algebraic expressions for the roots of a polynomial in a single variable.

Exercises

Exercise 1. Pronounce and remember the following:

Algebraic operations-алгебраик ифода, алгебраическое действие

Infinite series-чексиз қатор, бесконечный ряд

Calculation-ҳисоблаш, вычисление

Concept-тушунча, ғоя, концепция
Abstract-мавҳум, абстракт
Logic-мантик, логика
Set-қатор, ряд, система
Addition-қўшиш, сложение
Subtraction-айириш, вычитание
Multiplication-кўпайтириш, умножение
Division-бўлиш, деление

Exercise 2. Form the new words with the help of suffixes. Translate the words. Similar, different, equal, part, power, use, need, reason, count, represent.

Exercise 3. Translate the following into Uzbek or Russian:
Binary operation, identity elements, notion, positive natural members, inverse elements, associativity, commutativity, matrix multiplication, properties, requirement.

Exercise 4. Translate the following into English.
Мураккб, сон, йиғинди, лимит, текширмак, бутун сон, ҳақиқий сон, диапазон, тескари функция, шакл, қўллаш, ўнли, ўнли каср, ўнли нуқта.

Exercise 5. Make up sentences from the following.

1. addition (+), can be, subtraction (-), multiplication (\cdot), and division (\div), binary operations.
2. a property, addition, has, called associativity, of integers.
3. a property, addition, has, also called commutativity, of integers.
4. zero, for addition, is, the identity element.
5. give, of inverse elements, the negative number, rise, to the concept.
6. linear algebra, in which, of vector spaces, the specific properties, are studied.

Exercise 6. Translate the sentences paying attention to the Past Indefinite Tense.

1. Addition and multiplication are viewed as general operations.
2. Elementary algebra taught to students who are presumed to have no knowledge of mathematics beyond the basic principles of arithmetic.
3. Brahmagupta was the first to solve equations using general methods.
4. He solved the linear indeterminate equations, quadratic equations, second order indeterminate equations and equations with multiple variables.
5. Diophantus has traditionally been known as “the father of algebra” but debate now exists as to whether or not Al-Khorazmi should take that title.
6. Zhu Shijui solved various cases of cubic, quartic, quinary and higher order polynomial equations.

Exercise 7. Make up some questions the answers of which are the following.

1. The result of additions of numbers is called the sum or total of the numbers.
2. The numbers to be added are called the addends.

3. The number resulting from the multiplication is called the product.
4. The number that is to be divided is called the dividend.
5. Addition of integers has a property called associativity.
6. If a group is also commutative—that is, for any two members a and b of S , $a \cdot b$ is identical to $b \cdot a$ —then the group is said to be Abelian.

Exercise 8. Answer the following questions.

1. What is arithmetic concerned with?
2. How is the result of addition called?
3. Why are mathematics and numbers important?
4. What signs are used in algebra?
5. What do signs (+) and (-) indicate?
6. What is the meaning of the multiplication sign?
7. What is binary operation?
8. What do we use in algebra to represent numbers?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Do not cross the bridge before you cross it.
2. A sleeping man is no better than a dead man.

The fractions

A fraction represents a part of one whole thing. A fraction indicates that something has been cut or divided into a number of equal parts. For example, a pie has been divided into four equal parts, if you eat one piece of the pie, you have taken one part out of four parts. This part of the pie can be represented by the fraction $\frac{1}{4}$. The remaining portion of the pie which consists of three of the four equal parts of the pie is represented by the fraction $\frac{3}{4}$.

In a fraction the upper and lower numbers are called the terms of the fraction. The horizontal line separating the two numbers in each fraction is called the fraction line. The top term of a fraction or the term above the fraction line is called the numerator; the bottom term or the term below the fraction line is called the denominator.

A fraction may stand for part of a group. There is a group of 5 apples. Each is $\frac{1}{5}$ (one fifth) of the group. If we take away 2 apples we say that we are removing $\frac{2}{5}$ of the number of apples present. If we take away 3 apples, we are removing $\frac{3}{5}$ of the apples present. In this instance, a fraction is being used to stand for a part of a group.

A fraction is also indicates division. For example: one apple was divided into eight parts and the man has eaten one part. Therefore he has eaten $\frac{1}{8}$ of the apple. How much of the apple is left? How many eighths are in the whole apple?

Principle to remember. If in any fraction the numerator and denominator are equal, the fraction is equal to 1.

Exercises

Exercise 1. Pronounce and remember the following:

Fractions-каср, дробь

Indicate-кўрсатмоқ. показывать

Numerator-сурат, числитель

Horizontal line-горизонтал чизик, горизонтальная линия

Separate-мустақил, алоҳида, отдельный

Denominator-махраж, знаменатель

Number-сон, число, количество

Sign-белги, аломат, знак, символ

Piece-бўлак, часть

To be equal to-тенг, равен

Exercise 2. Form the new words with the help of suffixes. Translate the words.
To enter, to hold, to grow, technique, short, a subject, to discuss, change.

Exercise 3. Translate the following into Uzbek or Russian:

Remaining, portion, is equal to, to apply, to consist of, represented by, may stand for, is being used, for the convenience, without changing, mixed number.

Exercise 4. Translate the following into English.

Касрий қисм, ўнли каср, аниқламоқ, ўрин, бири остига иккинчиси, бир чизикқа, ўнг томондан келадиган.

Exercise 5. Make up sentences from the following.

1. five, are, five, times, twenty five.
2. six times, sixty, are, ten.
3. separating, the horizontal line, the, two numbers.
4. an angle, and, less than 90 , more than 0.
5. a figure formed, when, a point, two, straight, lines, intersect at.
6. square, the number, of, contained, units, of, in the surface, a plane figure.

Exercise 6. Translate the sentences paying attention to Modal Verbs.

1. A fraction can be reduced to lower terms if the numerator and the denominator are divisible by a single number. That is if they have a common divisor.
2. For convenience and clarity a fraction must always be expressed in its simplest form.
3. That is, must be reduced to its lowest terms.
4. To add fractions having different denominators the fractions must be changed to equivalent fractions which have the same or a common denominator.
5. Reduction can be done by dividing a numerator and denominator by the same number.
6. Fractions can be compared.

Exercise 7. Make up some questions the answers of which are the following.

1. If the numerator of a fraction is less than denominator the fraction is called a proper fraction.
2. If the numerator of a fraction is equal to or larger than the denominator the fraction is called an improper fraction.
3. A number which consist of a whole number and a fraction is called a mixed number.
4. A fraction indicates that something has been cut or divided into a number of equal parts.
5. The horizontal line separating the two numbers in each fraction is called the fraction line.
6. The top term of a fraction or the term above the fraction line is called the numerator.

Exercise 8. Answer the following questions.

1. What does a fraction represent?
2. What do we call “the terms of fraction”?
3. What is the numerator (denominator)?
4. What does a fraction indicate?
5. When the fraction equal to 1?
6. What should one do in order to add fractions having the same denominator?
7. What should one do in order to subtract fractions having the same denominator?
8. How do you multiply fractions having the same denominators?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. What is done cannot be undone.
2. There is no smoke without fire.

Graphs

Graph is a representation of relationships by means of lines, bars, circles or symbols. Bar graph is a graph made up of parallel bars whose lengths represent given quantities drawn to scale. A graph represents numerical relationship in visual form. By use of a graph we can show the relation between certain sets of numbers in an interesting, pictorial manner so that they can actually be seen.

The most commonly used graphs are: the pictograph, the bar graph, the line graph and the circle graph. In a pictograph, each picture or symbol represents a definite quantity. In a pictograph we use pictures of objects to represent numbers. The length of bars in a bar graph represents numerical facts. The bars are of varying length but of the same width. They are usually used to show size or amount of different items or size or amount of the same item at different times. The bars of a vertical bar graph are drawn straight up and down, that is at right

angles with the horizontal base line of the graph. The bars of a horizontal bar graph are drawn across the page.

The line graph shows the changes in a quantity by the rising or falling of a line. The position of the line with relation to the horizontal and vertical scales represents numerical facts. The line connects a number of points.

An apportionment or distribution graph shows the relationship of all parts of a particular whole. The whole graph represents 100%. A chart which consists of a circle broken down into subdivision is called a circle graph. A circle graph is used to show how all the parts are related to the whole. The entire circle, which equals 360° , represents the entire thing. Circle graph is a graph in the form of a circle in which the angles (parts) indicate relations to each other and to the whole.

Exercises

Exercise 1. Pronounce and remember the following:

Graph-график, диаграмма

Pictograph-пиктограмма

Pilgraph circular-айлана диаграмма, круговая диаграмма

Visual-кўришга оид, зрительный

Provide-таъминламоқ. доставлять

Item-пункт, параграф

Entire-тўла, бутун, целый

Protractor-угломер, транспортир

Change-алмаштирмақ, менять

Chart-харита, таблица

Exercise 2. Form the new words with the help of suffixes. Translate the words. Similar, different, define, coordinate, apply, geometry, trigonometry, frequent, possible, particular.

Exercise 3. Translate the following into Uzbek or Russian:

Can present, visual form, with relation to, is used to show, bar graph, line graph, pictograph.

Exercise 4. Translate the following into English.

Диаграмма, одатда, размер, турли нарсаларнинг сони, рақам, сон, режа, рекорд, ром, сон-саноксиз, танглик, танҳо.

Exercise 5. Make up sentences from the following.

1. very frequently, graphs are used, and, in newspapers, magazines, textbooks, reference books.
2. graph, of, mathematical, the picture, is, equation.
3. in a pictograph, of objects, we use, pictures, to represent numbers.
4. the line graph, shows, in a quantity, the changes, by the rising, or falling of a line.
5. the line, a number, connects, of, points.

6. a chart, consists of, which, a circle broken, is called, down into subdivision, a circle graph.

Exercise 6. Translate the sentences paying attention to the Future Indefinite Tense.

1. The most commonly used graphs are: the pictograph, the bar graph, the line graph and the circle graph.
2. A circle graph is used to show how all the parts are related to the whole.
3. Graphs are used very frequently in newspapers, magazines, textbooks and reference books.
4. Graphs picture facts and figures so clearly that one can understand them at a glance.
5. I shall study in the library from five till seven.
6. This text is translated from English.

Exercise 7. Make up some questions the answers of which are the following.

1. A chart which consists of a circle broken down into subdivision is called a circle graph.
2. A circle graph is used to show how all the parts are related to the whole.
3. Graphs are used very frequently in newspapers, magazines, textbooks and reference books.
4. In a pictograph we use pictures of objects to represent numbers.
5. The line graph shows the changes in a quantity by the rising or falling of a life.
6. The Romans used seven capital letters (I, V, X, L, C, D, M) to represent numbers.

Exercise 8. Answer the following questions.

1. What does a graph present?
2. What can we do by using a graph?
3. What are the most commonly used graphs?
4. What is the difference between a pictograph and the bar graph?
5. How are the bars of a vertical (horizontal) graph drawn?
6. What do we call a circle or a line graph?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. A good beginning is half the battle.
2. Life is not all cakes and ale.

What is geometry?

Recorded development of geometry spans more than two millennia. It is hardly surprising that perceptions of what constituted geometry evolved throughout the ages. The geometric paradigms presented below should be viewed

as Pictures at an exhibition of a sort: they do not exhaust the subject of geometry but rather reflect some of its defining themes.

The study of lines and closed figures made by lines is called geometry. Geometry is a branch of mathematics which investigates the relations, properties and measurement of solids, surfaces, lines and angles. The two points may be at any distance apart, so a straight line may be considered as having any length. A broken line is a line formed of successive sections, or segments of straight lines.

A curved line or simply a curve, is a line no portion of which is straight.

Practical geometry. There is little doubt that geometry originated as a practical science, concerned with surveying, measurements, areas, and volumes. Among the notable accomplishments one finds formulas for lengths, areas and volumes, such as Pythagorean Theorem, circumference and area of a circle, area of a triangle, volume of a cylinder, sphere and a pyramid. Development of astronomy led to emergence of trigonometry and spherical trigonometry, together with the attendant computational techniques.

Axiomatic geometry. A method of computing certain inaccessible distances or heights based on similarity of geometric figures and attributed to Thales presaged more abstract approach to geometry taken by Euclid in his Elements, one of the most influential books ever written. Euclid introduced certain axioms, or postulates, expressing primary or self-evident properties of points, lines and planes. He proceeded to rigorously deduce other properties by mathematical reasoning. The characteristic feature of Euclid's approach to geometry was its rigour. In the twentieth century, David Hilbert employed axiomatic reasoning in his attempt to update Euclid and provide modern foundations of geometry.

Exercises

Exercise 1. Pronounce and remember the following:

Investigate-текширмак, изучать

Relation-алоқа, отношение

Proportion-теорема

Measurement-ўлчов, измерение

Solid-жисм, геометрическое тело

Surface-сирт, юза, поверхность

Line-чирик, линия

Angle-бурчак, угол

Length-узунлик, длина

Straight-тўғри, прямой

Exercise 2. Form the new words with the help of suffixes. Translate the words.

To construct, to represent, to multiply, to form, to displace, to measure, to draw, to study, to find.

Exercise 3. Translate the following into Uzbek or Russian:

Thickness, width, through, position, closed, figures, indefinitely, a broken line, to be represented by, labeled by, representation, distance.

Exercise 4. Translate the following into English.

Ўткир (бурчак)-острый угол, ёй (дуга), биссектриса, даража (градус, степень), тенг бурчакли (равно угольный), тенг томонли (равно сторонний), катталиқ (величина), ўлчамоқ (измерять), ўлчаш (измерение).

Exercise 5. Make up sentences from the following.

1. branch, geometry, is, the, of mathematics.
2. investigates, geometry, the relations, of solids, properties, and measurements, surfaces, lines and angles.
3. having, a plane figure, and six sides, six angles (hexagon).
4. a statement of, expressed, a general rule, by means of, letters, numbers, and (formula).
5. a four-sided, whose, figure, opposite, are parallel, sides.
6. a plane figure, any numbers, of, having, sides, angles, and (polygon).

Exercise 6. Translate the sentences paying attention to the Past Indefinite Tense.

1. Euclid introduced certain axioms or postulates, expressing primary or self-evident properties of points, lines and planes.
2. Euclid proceeded to rigorously deduce other properties by mathematical reasoning.
3. Leonhard Euler boldly cast out metric properties of geometric figures and considered their most fundamental geometrical structure based solely on shape.
4. Leibnitz invented a calculating machine and devised what was in many respects a noble method of calculation.
5. In 1801 Gauss published an important work on the theory of numbers and other analytical subjects; Disquisitiones Arithmetical.
6. Gauss was appointed as professor of mathematics and director of the observatory of Gottingen.

Exercise 7. Make up some questions the answers of which are the following.

1. An angle is the inclination to one another of two straight lines that meet.
2. The point at which two lines meet is called the vertex of the angles.
3. An acute angle is less than a right angle.
4. An obtuse angle is greater than a right angle.
5. A square is a quadrilateral in which all the sides are equal and all the angles are right angles.
6. The vertex angle of a triangle is the angle opposite the base.

Exercise 8. Answer the following questions.

1. What is geometry?
2. How many lines can be drawn between two points?
3. What does plane geometry treat of?
4. What is an angle?
5. When is an angle formed?

6. What angles do you know?
7. What is Pythagorean Theorem?
8. What do in geometry David Hilbert?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Every bird likes its own nest.
2. Nothing seek, nothing find.

Symmetry

Line Symmetry. A dotted line has been drawn in this figure. The figure is now divided into two parts that have the same size and shape. If the figure is folded on the dotted line, the two parts will coincide. We say that the figure is symmetrical about the dotted line. The dotted line is called the axis of symmetry.

It is possibly for a figure to have more than one axis of symmetry. Line RS is an axis of symmetry. If we fold the figure along RS , the two parts will coincide. A point on the left side will fall on only one point on the right side Any two such points are called corresponding points. For example, A and B are corresponding points. AV is also an axis of symmetry. Then B and R are corresponding points. What is the third possible axis of symmetry? What two points will correspond when this axis is drawn?

Notice, if line AB is drawn, the axis of symmetry RS is perpendicular to, and bisects AB . If a figure has line symmetry, then the axis of symmetry must be perpendicular to the line joining every two corresponding points and must also bisect it.

Point Symmetry. If a dotted line is drawn from any one point on the figure above to any corresponding point, the dotted line will be bisected in the point O . The figure has balance about point O and is therefore, an example of point symmetry. Point O is called the centre of symmetry. If a figure has point symmetry, then the line which connects every two corresponding points must pass through the centre of symmetry and be bisected by it. It is possible for a figure to have both point symmetry and line symmetry. An example is the circle. Any diameter will be an axis of symmetry. Hence the circle possesses line symmetry. Pick any point A on a circle. Connect this point with centre O . Extend this line to a point B , on the other side of the circle. The radius OA is equal to the radius OB . Because this is true of any line drawn through O and bounded at either end by the circle, O is the centre as well as line symmetry.

Plane symmetry. If a solid can be divided into two equal solids by plane, and if every part on one side of the plane has a corresponding part on the other, the original solid has plane symmetry.

Exercises

Exercise 1. Pronounce and remember the following:

Dot-нуқта, точка (белги)
Dotted-нуқтали, пунктирний
Corresponding-мувофик, соответственный
Coincide-тўғри келмоқ, совпадать
Computation-ҳисоблаш, вычисление
Possibility-имконият, возможность
Drawing-чизмачилик, черчение
Figure-швкл, тасвир, фигура, рисунок
Point-нуқта, точка
Side-томон, сторона

Exercise 2. Form the new words with the help of suffixes. Translate the words.
To enter, probably, an economy, technique, hope, short, a subject, to grow, to instruct, to establish.

Exercise 3. Translate the following into Uzbek or Russian:
To fold on the dotted line, to be symmetrical about the dotted line, to fold the figure along, to fold on the left side, to join, to fold, to divide.

Exercise 4. Translate the following into English.
Симметрия чизиғи, симметрия нуқтаси, марказ, радиус, тенг, диаметр, чизик, айлана, ўқ, перпендикуляр.

Exercise 5. Make up sentences from the following.

1. the axis, the dotted, line, of symmetry, is called.
2. point O, the centre of, is called, symmetry.
3. a figure, it is possible for, to have, both point symmetry, and, line, symmetry.
4. the greatest, of, a quantity, is , value, maximum.
5. formula is, a statement, numbers, of a general, of letters and, expressed by means.
6. decagon is, a polygon, ten sides, having, and ten angles.

Exercise 6. Translate the sentences paying attention to the Present Perfect Tense.

1. A dotted line has been drawn in this figure.
2. If the figure is folded on the dotted line, the two parts will coincide.
3. If the figure has line symmetry, then the axis of symmetry must be perpendicular to the line joining every two corresponding points and must also bisect it.
4. He seems to have finished his work.
5. He avoided answering my questions.
6. He quit trying to solve the problem.

Exercise 7. Make up some questions the answers of which are the following.

1. The dotted line is called the axis of symmetry.

2. It is possible for a figure to have more than one axis of symmetry.
3. Octagon is a plane figure containing 8 sides and 8 angles.
4. Obtuse angle is an angle containing more than 90° but less than 180°
5. Minimum is the smallest value of a quantity.
6. If a solid can be divided into two equal solids by a plane, and if every part on one side of the plane has a corresponding part on the other, the original solid has plane symmetry.

Exercise 8. Answer the following questions.

1. What figure has line symmetry?
2. How many axes of symmetry can figures have?
3. What points are called corresponding ones?
4. What is meant by point symmetry?
5. What is meant by plane symmetry?
6. What is the third possible axis of symmetry?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. A hungry man is an angry man.
2. The greatest talkers are the least doers.

Lines

A line has no width or thickness. It has length and direction. An indefinite number of straight lines can be drawn through one point.

Since a line extends indefinitely in either direction, we must work with line segments or portions of lines. The segment is represented by two capital letters, one placed at each end. The line segment AB or BA is shown. It can also be represented by small letters. Hence is a line segment. A line joins two points. Only one straight line can be drawn between two points. There are three kinds of lines: straight, curved and broken.

Each straight line that forms the boundary of a square, for example, will have two extremities; obviously. But we imagine that a straight line could be extended for as far as we please, and here we touch on the question of infinity. Which is something more than “for as far as we please”. It is the idea of something with no endpoints at all.

For as long as there have been mathematicians, there have been quarrels about “infinity”. What does it mean to say that something is infinite? Not that it could be, or that it will be, but that it is. Does what can never be whole exist? Fortunately, for our purposes it will not be necessary to confront this knotty issue, because we will never have need of infinite lines. It is only finite lines- the actual or potential boundaries of a figure-that we ever require. Hence, when we speak of a “straight line”, we will mean what people normally mean, namely a line with that

any finite line, such as each side of a triangle, is but a portion of an actually infinite line.

Hence they call a finite line a “line segment”. Our idea is quite the reverse, namely that we can extend any straight line for as far as we please. Such a line will be potentially infinite, but it is not actually infinite. These quarrels about actual versus potential infinities arise only when straight lines are abstracted from the boundaries of figures. Also, just because we can define something does not guarantee that what we have defined exists. As we shall see, the mathematical existence of a geometrical object, as well as our right to say that we know it, requires that we be able to produce it. This completes the preliminary description, this is what plane geometry is about, and we are now ready to study it as a logical science.

Exercises

Exercise 1. Pronounce and remember the following:

Straight line-тўғри чизик, прямая линия

Boundary-чегара, граница

Square-майдон, квадратное поле

Extremities-қуйи, конец, край

Obviously-аниқ, очевидный

Infinite-чексиз, бесконечный

Necessary-зарур, необходим

Potential-потенциал

Point-нуқта, точка

Rectilinear-тўғри чизикли, прямолинейный

Oblique- қия (бурчак) косой угол

Obtuse- ўтмас (бурчак) тупой угол

Exercise 2. Form the new words with the help of suffixes. Translate the words.

Usual, horizontal, accurate, equal, general, up, after, down, to, write, call.

Exercise 3. Translate the following into Uzbek or Russian:

Acute, obtuse, turn, unit, number, supplementary, complementary, reflex, vertex, axis, straight.

Exercise 4. Translate the following into English.

Ўтқир бурчак, ўтмас бурчак, квадрат юзи, радиус, диаметр, нисбат, тўртбурчак, мос келувчи, ёндаги (боковой), узунлик (длина), исботламок (доказывать), пирамида, математика соҳаси (отрасль математики), эгри чизик (кривая линия).

Exercise 5. Make up sentences from the following.

1. a straight line, point, to, any point, any to draw.
2. a parallelogram, a quadrilateral, is, whose, sides, opposite, are parallel.
3. less, an acute, angle, a right angle, is, than.

4. greater, an obtuse, angle, a right angle, is, than.
5. a straight line, through the centre, drawn, of a circle, the circle, and dividing, into, two equal parts.
6. height is, from the top, the distance, to the base, of, an object.

Exercise 6. Translate the sentences paying attention to the verb “to be”.

1. Any plane figure bounded by three straight lines is called a triangle.
2. Two straight lines can intersect is only one point.
3. Geometry is the science of extension and position in space, or the science of position, form and magnitude.
4. An angle is formed when two straight lines meet a point.
5. The lines are called the sides of an angle.
6. The name of the triangle is derived from the Latin word “triangulum” tree angle, which in its term was derived from the Greek word “tri-gonon” or three-angle.

Exercise 7. Make up some questions the answers of which are the following.

1. A line, which may be either straight or curved, is the magnitude length.
2. A quadrilateral is a plane figure bounded by four straight lines.
3. A parallelogram is any quadrilateral in which two pairs of opposite sides are parallel.
4. A rectangle is a parallelogram whose angles are all right angles.
5. A square is a rectangle in which all the sides are equal in length.
6. A pentagon is a polygon which has five sides.

Exercise 8. Answer the following questions.

1. What kind of lines do you know?
2. What are three main relative situations between the straight line and the plane?
3. Has a line width or thickness?
4. Has a line length or direction?
5. What do we call a point at which the sides of an angle meet?
6. What is “a line segment”?
7. What are horizontal bars?
8. What does it mean to say that something is infinite?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Choose the book as chose a friend.
2. Every cloud has a silver lining.

The circle

A circle is a plane figure bounded by one line called the circumference, such that all straight lines drawn from the center to the circumference are equal to one another. A straight line from the center to the circumference is called a radius. A diameter is a straight line through the center and terminating in both directions on the circumference. A radius, then, is a half of a diameter; or equivalently, a diameter is twice a radius:

$$D=2r.$$

The definition of π

The student no doubt knows a value for the famous irrational number π -3.14-but that is not its definition. What, in fact is the meaning of the symbol “ π ”?

π symbolizes the ratio-the relationship with respect to relative size-of the circumference of circle to its diameter, whatever that relationship might be.

So when we say that π is approximately 3.14, we mean that the circumference of circle is a little more than three times the diameter.

$$\frac{C}{D} = \pi \approx 3.14$$

It should be infinitely clear that π cannot be a rational number, because it indicates the ratio of a curved line to a straight. And to name such a ratio exactly impossible.

$$C = \pi D$$

Exercises

Exercise 1. Pronounce and remember the following:

Circumference-айлана, окружность

Coincide-москелмоқ, совпадать

Construction-қуриш, яшаш, построение

Diagonal-диагональ

Diameter-диаметр

Distant-олис, йироқлашган, отдаленный

Square-квадрат, квадратный

Circle-доира, круг

Extension-ўлчамдорлик, протяженность

Extremity- яқун, оконечность

Exercise 2. Define the parts of speech by suffixes:

Labour, greatly, logical, significant, merely, number, various, important, figure, extraction, positive, quantity, division.

Exercise 3. Translate the following into Uzbek or Russian:

Plane figure, bounded, terminating in both directions, equivalently, the definition of π , irrational number, relationship, approximately, intuitively, indicates.

Exercise 4. Translate the following into English.

Баладлик (высота), даража (градус), тенг ёнли (равнобедренный), ўлчаш (измерение), қисм (часть), тенг бўлмаган томонли (неравносторонний), циркуль, чизик (линейка).

Exercise 5. Make up sentences from the following.

1. weight, the gramme, of, a unit, is.
2. symbol, x is, the, for, number, an unknown.
3. sixty, are, there, seconds, in a minute.
4. called, the symbol V, is, sign, the radical.
5. we, percentage, by means, express, of sign %.
6. an equality, a proportion, of, ratios, is, called.

Exercise 6. Translate the sentences paying attention to the Present Indefinite Tense

1. Circles have the same ratio to one another as their circumscribed squares.
2. A circle is a closed plane figure formed by a curved line every point of which is equally distant from one and the same point inside the figure.
3. A circle is generally designated in writing and printing by means of the symbol O.
4. Any circle on the sphere whose plane passes through the centre is a small circle.
5. Any circle on the sphere whose plane does not pass through the centre is a small circle.
6. Any great circle passing through the poles is called a meridian circle.

Exercise 7. Make up some questions the answers of which are the following.

1. Plane geometry treats with plane figures.
2. The following symbols are used in plane geometry.
3. When the requirement is satisfied, the problem is solved.
4. The full statement of a theorem consists of two parts.
5. The basic elements of geometry are points, lines and planes.
6. In the 17th century a scheme was devised for uniting geometry and algebra.

Exercise 8. Answer the following questions.

1. What kind of geometrical figure is the circle?
2. What is a radius?
3. What is a diameter?
4. What is the circumference?
5. How is a half of the circle called?
6. To what is the area of a circle equal?
7. How is the circle formed and what elements and divisions of a circle do you know?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Years teach more than books.
2. The morning sun never lasts a day.

Trigonometric functions

A branch of mathematics dealing with the relationship between the sides and angles of triangles is called trigonometry. It is defined as a branch of mathematics using the fact that numerous problems may be solved by the calculation of unknown parts (sides and angles). The solution of such problems is greatly assisted by the use of the trigonometric ratios or functions.

Trigonometric is based on certain “fractions” of angles. A function is quantity that depends on another quantity for its value. Any quantity that depends upon an angle for its value is the function of that angle. If a right triangle is constructed, having a certain angle at one corner, there will be certain definite relations between the sides of this triangle.

There ratios are six in number and are called the trigonometric functions. In any right triangle, we call the two lines that form the right angle the sides, while the line opposite the right angle is called the hypotenuse.

In speaking of the angle PON in the triangle PON the side NP is called the opposite side, while the side ON is called the adjacent side. The ratio of the opposite side to the adjacent side is called the tangent of the angle. The tangent is abbreviated tan. Hence, $\tan \text{NOP} = \text{NP}/\text{ON}$. The ratio of the adjacent side to the opposite side is called cotangent (abbreviated cot.). $\text{Cot NOP} = \text{ON}/\text{NP}$, the word cotangent is an abbreviation or shortening of the word: “complementary tangent” or “tangent of the complementary angle”. The tangent of any angle is the cotangent of its complement, and the cotangent of any angle is the tangent of its complement.

Exercises

Exercise 1. Pronounce and remember the following:

Right-тўғри, прямой

Relation-алоқа, отношение

Ratio-нисбат, пропорция

Angle-бурчак, угол

Triangle-учбурчак, треугольник

Identify-аниқламоқ, отождествлять

Tangent-тангенс

Cotangent-котангенс

Hypotenuse-гипотенуза

Adjacent-ёпишган, прилежающий

Exercise 2. Form the new words with the help of suffixes. Translate the words.

To make, to relate, to divide, to organize, to opposite, to construct, to write, to call, to definite, to abbreviate.

Exercise 3. Translate the following into Uzbek or Russian:

Functions, opposite side, adjacent side, complementary, acute angle, equation, reciprocal, cosine, reverse, cosecant, five in number, hypotenuse, to depend on.

Exercise 4. Translate the following into English.

Тригонометрия, ўлчамок, ўлчов, тўғриламак, икки чизик оралиғида, гипотенуза деб аталади, учбурчак, тўғри бурчак, илдиз, эгри чизик.

Exercise 5. Make up sentences from the following.

1. mathematics, trigonometry, is, of, a branch.
2. about, many problems, can be solved, alternative, current, trigonometry, by, using.
3. trigonometry, applications, has, in surveying, navigation, construction, work, many branches of science, and.
4. triangle, is, plane figure, a closed, with three sides, three angles, and.
5. acute triangle is, acute angles, a triangle, all having.
6. ratio, by means, the comparison, of, two like quantities, of a division.

Exercise 6. Translate the sentences paying attention to the Modal Verbs.

1. Otherwise we can say that trigonometry is the set of methods and procedures required to solve problems concerning triangles when angles of the triangles are involved.
2. Many problems about alternating current can be solved by using trigonometry.
3. In plane geometry it is shown that if two sides and one acute angle of a right triangle are given, the triangle can be constructed and the unknown sides and angles found by measurement.
4. The same result can be obtained much more accurately by means of the modified definitions involves three parts of the triangle.
5. There are only a few angles for which the trigonometry functions can be found by geometrical considerations, and, therefore, tables must be used from which the values of the trigonometric functions of angles between 0° and 45° but a few theorems about trigonometric functions of complementary and related angles permit us to find from these tables the functions of any angle.

Exercise 7. Make up some questions the answers of which are the following.

1. Trigonometry is a branch of mathematics that deals with angles and sides of triangles and their relations to one another.
2. Trigonometry has applications in surveying, navigation construction work and many branches of science.
3. In any right triangle, we call the two lines that form the right angle the sides, while the line opposite the right angle is called the hypotenuse.
4. The ratio of the opposite side to the adjacent side is called the tangent of the angle.
5. The ratio of the adjacent side to the opposite side is called the cotangent.
6. Isosceles triangle is a triangle having two equal sides.

Exercise 8. Answer the following questions.

1. What does trigonometry deal with?
2. What is a trigonometric function?
3. What lines in any right triangle are called sides?
4. What is called the tangent of the angle?
5. What is called cotangent?
6. What is the sine of an angle?
7. What is the cosine of an angle?
8. What is the secant of an angle?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Birds of a feather flock together.
2. There is no time like the present.

Complex numbers

The numbers used in elementary algebra and in the ordinary calculus are either positive, or zero. Such numbers-collectively called real numbers-can be represented by the points on a straight line, in the manner familiar from analytic geometry.

There are, however, simple algebraic operations which cannot always be carried out in terms of real numbers. An example is the extraction of the square root of a given real number C , i.e. the problem of finding a number x such that $x^2=c$. If c is positive, the problem has two solutions, denoted by \sqrt{c} and $-\sqrt{c}$. if c is zero, the solution is $x=0$. If c is negative, there clearly does not exist areal number x such $x^2=c$, since the square of a real number is either positive or zero, but never negative.

The same difficulty is encountered in an attempt to solve the general quadratic equation $x^2+2bx+c=0$, where b and c are real numbers. Since the equation may be brought into the form $(x+b)^2=b^2-c$, it clearly cannot have a real solution x if b^2-c is negative. Accordingly a quadratic equation with real coefficients may, or may not, have real solutions. This, however, does not exclude the possibility of the equation having solutions which belong to a more general class of numbers. To illustrate this situation by an elementary example, let us suppose that we have no conception of negative numbers and that we are called upon to solve the equation $x+a=b$, where a and b are positive numbers. We would then have to distinguish between two cases.

If $b=a$, the equation has a solution, and if $b<a$ it has not. As we know, this distinction is made unnecessary by the introduction of negative numbers, i.e., by postulating that the equation $x+1=0$ has a solution and by denoting this solution by -1 . This procedure may initially look rather arbitrary, but it is then justified by showing that the unusual laws of arithmetic can safely be applied to negative numbers provided a few simple rules-such as , for example, $(-a)(-b)=ab$ are observed.

The problem of finding a number whose square is a given negative number can be treated in a similar way. We define a number I by the equation $i^2=-1$. and

we then show that the introduction of this number and the use of numbers of the form $i=a+bi$, where a and b are real numbers, are compatible with the usual laws of arithmetic if certain elementary rules are observed.

Exercises

Exercise 1. Pronounce and remember the following:

Analytic-аналитик, аналитический

Collectively-биргаликда,совокупность

Commutative-ўрин алмашадиган, перестановочный

Connotation-кўшимча қиймат, дополнительное значение

Definition-таъриф, определение

Encounter-учрамоқ, встречаться

Reduce-қисқартирмоқ, сокращать

Represent-ифодаламоқ, изображать

Similarly-шунга ўхшаш, подобным образом

Let us suppose-фараз қилайлик, допустим

Exercise 2. Form the new words with the help of suffixes. Translate the words. To oppose, to produce, great, logic, applicate, a type, real, to depend, situate, general, to establish, safe.

Exercise 3. Translate the following into Uzbek or Russian:

Positive, negative, possibility, solution, illustrate, distinction, introduction, procedure, safely, obvious, commutative, associative, complex number.

Exercise 4. Translate the following into English.

Ўхшашли (ассоциативный), ўхшаш (совместный), ҳисоб (вычисление), тасдиқламоқ (подтверждать), бир хил (одинаковый), ифодаларда (в выражениях), тасаввур қилинган

(воображаемый), умумийлик (всеобщность), ҳамма миқдор (все количество)

Exercise 5. Make up sentences from the following.

1. algebra, the numbers, in elementary, used.
2. only, number, positive, have, square, real, roots.
3. only, number, negative, have, square, imaginary, roots.
4. a number α , is, of the form (2), a complex, called, number.
5. the real number, the real part, is called, of the complex number α , and, by the symbol $\text{Re } \alpha$, denoted.
6. the number, is read, 3*5 five, three, point.
7. x is, for, the symbol, number, an unknown.
8. the triangle, and, are, geometrical, the square, figures.

Exercise 6. Translate the sentences paying attention to Modal Verbs.

1. Such numbers-collectively called real numbers-can be represented by the points on a straight line, in the manner familiar from analytic geometry.
2. There are however, simple algebraic operations which cannot always be carried out in terms of real numbers.
3. Since the equation may be brought into the form $ax^2 + bx + c = 0$, it clearly cannot have a real solution if $b^2 - 4ac < 0$.
4. Accordingly a quadratic equation with real coefficients may or may not, have real solutions.
5. The problem of finding a number whose square is a given negative number can be treated in a similar way.
6. The reader will observe that the last result can be obtained by multiplying out the two parenthesis and using $(a + bi)^2 = a^2 - b^2 - 2abi$.

Exercise 7. Make up some questions the answers of which are the following.

1. The numbers used in elementary algebra and in the ordinary calculus are either positive, or zero.
2. The Romans used seven capital letters to represent numbers: I, V, X, C, D and M.
3. Negative number- a number whose value is less than zero and which is preceded by minus sign.
4. Approximate number-a number that is not exact but whose accuracy is sufficient for the purpose desired.
5. Consecutive numbers-numbers that follow one another, such as 1,2,3,4 etc.
6. Positive number- a number whose value is greater than zero and which is sometimes preceded by plus sign.

Exercise 8. Answer the following questions.

1. Can simple algebraic operations always be carried out in terms of real number?
2. Does there exist a real number x such that $x^2 = -1$?
3. Can the usual laws of arithmetic be applied to complex number?
4. What number is called a complex number?
5. What is called the real part of the complex number α ?
6. What is called the imaginary part of α ?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Nothing ventured, nothing gained.
2. We are not born for ourselves.

PART-IV **CHEMISTRY**

Seeing atoms

It would be correct to say that isoprene is a sort of initial natural monomer. In the course of polymerization the isoprene molecule undergoes a slight change: the double bonds between the carbon atoms open, and the free bonds link up the units into the gigantic rubber molecules.

The problem of producing synthetic rubber drew the attention of scientists and engineers long ago.

At first glance the job did not seem very tricky. One had to produce isoprene and then make it polymerize, i.e. make the isoprene units combine into long and flexible chains or artificial rubber.

But reality was disappointing. Chemists succeeded with some difficulty in synthesizing isoprene, but when it came to polymerizing it rubber did not result. The units combined with each other, but did so haphazardly rather than in a definite order and the result was artificial products which resembled rubber slightly but differed from it in many respects.

And so the chemists had to invent methods of making the isoprene units connect up into a chain in the right way.

Exercises

Exercise 1. Pronounce and remember the following:

Pattern-намуна

Surface-сатҳ, юза

Slender-нозик

Flashlight-чақмоқ

Reach-эришмоқ, етишмоқ

Tiny-жуда кичик

Measure-ўлчам

Exercise 2. Form the new words with the help of suffixes. Translate the words. Beauty, scan, image, atom, limit, divide, produce, contain.

Exercise 3. Translate the following into Uzbek or Russian:

Individual atoms, scanning-tunneling microscope, chair's outline, diameter of an atom, human hair.

Exercise 4. Translate the following into English.

Атомларни кўриш, гўзал намуна, ўнлаб атомлар, кўз ўнгидаги тасаввур, ўлчамоқ, текшириб кўрмоқ.

Exercise 5. Make up sentences from the following.

1. cannot, you, with, see, DNA, a light microscope, with.

2. last few years, in the, overcome, has been, limitation, this.
3. of DNA, ever made, photograph, the first, is figure B.
4. are, in the picture, atoms, beautiful, very.
5. must, we, two, distinguish, sub-questions.
6. do, in life, need, you, what.
7. would be, in, better, opinion, it, much.
8. to, time, to the laboratory, for him, it is.

Exercise 6. Translate the sentences paying attention to the structure of the words in the sentence.

1. The beautiful pattern of yellow peaks you see in the picture is a DNA molecule.
2. You could find out by shining a flashlight in it.
3. You see the chair by putting a probe near its surface.
4. Atoms are very tiny molecules.
5. When Robert reached the age of fifteen it was found at the family council that he was an exceptionally clever boy.
6. When I was a kid I was shown a very dangerous experiment of chemicals.
7. We send the children to school as it was a summer garden where they got to be amused.
8. The teacher will be asking the students if you come and watch the molecule moving.

Exercise 7. Make up some questions the answers of which are the following.

1. The colour of DNA is yellow.
2. That's what optical and electron microscope do.
3. Figure B is the first photograph ever made of DNA.
4. Atoms are very tiny molecules.
5. I know what will happen.
6. The students were standing around chemical table and watching the atoms.
7. Chemistry is the science of molecules and their development.
8. It is natural that we should want to gain some understanding about the atoms.

Exercise 8. Answer the following questions.

1. What is this text about?
2. What are these yellow peaks in the pictures?
3. Where can we see the atoms?
4. Can we see the atoms by eyesight?
5. What can you say about the structure of atoms?
6. What is the result of joining several atoms?
7. How many atoms is the water consisting of?
8. What can you say about the movement of atoms?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Cut the coat according to the cloth.
2. A friend in need is a friend indeed.

Formation and elimination of ethanol in sugar beet roots

The results of enzymatic characterization of ethanol in condensed samples from sugar beet-root tissue showed that this tissue exhibited anaerobic glycolysis in addition to carboxylase activity when placed under oxygen stress. These findings confirm previous views based on nonspecific chemical analysis of ethanol. The discrepancy which existed between enzymatic assay and the dichromate method of analysis in this study was attributed primarily to materials other than ethanol, which were oxidized under conditions of dichromate analysis. This conclusion was based upon the consistent increase of actual ethanol determined by ADH assay, with the increasing anaerobic periods within and between harvest dates. Although dichromate oxidizable materials increased with longer anaerobic periods, the proportionate increases were not as were the values obtained by ADH assay.

These investigations showed that sugar beet plants, which were exposed to 3 and 6 hours of N₂, were capable of eliminating dichromate oxidizable substances, accumulated in roots during anaerobic periods. Plants from both treatments were still accumulating these substances after 8 hours in an aerobic environment. It appeared unlikely that this lag in response to normal oxygen concentrations could be explained by the slow rate of oxygen diffusion back into the tissue. It seemed more logical that the greatest portion of this 8-hour transition period was required for the tissue to revert to aerobic metabolism again. The apparent increases observed during this time might not be due to continued accumulation of ethanol, but rather an accumulation of intermediate materials oxidized under the conditions of the dichromate procedure.

Exercises

Exercise 1. Pronounce and remember the following:

Beetroot-лавлаг, свекла

Tissue-тўқима, ткань

Determine-аниқламоқ, определять

Environment-атроф-муҳит, окружающий мир

Harvest-ҳосил, урожай

Chemical analysis-кимёвий тажриба, химический анализ

Activity-фаолият, деятельность

Condense-конденсатор

Exercise 2. Form the new words with the help of suffixes. Translate the words. Add, active, proportion, accumulate, act, investigate, oxide, character, treat, consist.

Exercise 3. Translate the following into Uzbek or Russian:

Result, substances, based on, formation, elimination, oxygen, samples, nonspecific.

Exercise 4. Translate the following into English.

Ҳосил бўлмақ, аниқламақ, асосланган, мувофиқ, лавлаги ўсимлиги, кўпаймоқ, ҳосилнинг кўпайиши.

Exercise 5. Make up sentences from the following.

1. increases, as constant as, by ADH assay, the proportionate, were not, the values, obtained.
2. sugar beet plants, dichromate, oxidizable substances, these investigations, showed.
3. especially, a small, race, settled, on small, chalk, downs, longheaded, the.
4. contained, and water, also, amounts of carbon, dioxide, it, significant.
5. vegetable, the most, is, country, this, sufficient.
6. a different way, quite, in, works, teacher, is good.
7. by, learn, the, heart, words.
8. interesting, to, very, is, difficult, chemical, watch.

Exercise 6. Translate the sentences paying attention to the predicate in the sentence.

1. Formation and elimination of ethanol in sugar beet roots are very significant action.
2. These findings confirm previous views based on nonspecific chemical analysis of ethanol.
3. This conclusion was based upon the consistent increase of actual ethanol.
4. The apparent increases observed during the time night to be due to continued accumulation of ethanol.
5. Plants from both treatments were still accumulating these substances after 8 hours in an aerobic environment.
6. Light was coming through the corner flat.
7. Science is one of the most powerful influences moldings the English language into flesh shapes.
8. Invention and discoveries in the scientific experiments create the whole energy.

Exercise 7. Make up some questions the answers of which are the following.

1. This conclusion was based upon the consistent increase of actual ethanol determined by ADH assay.
2. Sugar beet plants were exposed to 3 and 6 hours of N₂
3. Plants were still accumulating these substances after 8 hours in an aerobic environment.
4. Amino-acids are colourless solids.
5. They react with nitrous acids with the evolution of nitrogen.
6. The man stopped and tilted the tube in the lab.
7. Chemistry is one of the powerful subjects in the world.

8. Formation of ethanol of sugar beet-roots is very significant action.

Exercise 8. Answer the following questions.

1. What is this text about?
2. To which chemical group does the ethanol refer to?
3. How many hours were the beet plants exposed to?
4. What are the nonspecific chemical analyses of ethanol?
5. In which periods do the oxidizable substances accumulate in roots?
6. What is the number of glucose in beetroot?
7. In which other substances besides beetroot can you find the ethanol?
8. How long should the plants accumulate the substances in an aerobic environment?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. A good name is better than riches.
2. Love conquers all.

The atmosphere of the early earth

The atmosphere of the early earth is also thought by most investigators to have been rich in hydrogen, although there is debate on this point. We refer to such an atmosphere as a reducing one, because of the ample availability of hydrogen atoms and associated electrons. There was little if any oxygen gas present. In such a reducing atmosphere, it did not take as much energy as it would today to form the carbon rich molecules from which life evolved. Our atmosphere has since changed as living organisms began to harness the energy in sunlight to split water molecules and form complex carbon molecules, giving off gaseous oxygen molecules in the process. Our atmosphere is now approximately 21% oxygen. In the oxidizing atmosphere that exists today the spontaneous formation of complex carbon molecules cannot occur.

The first step in the evolution of life, therefore, probably occurred in a reducing atmosphere, devoid of gaseous oxygen and different from the atmosphere that exists now. Those were violent times, and the earth was awash with energy: solar radiation, lightning from intense electrical storms, violent volcanic eruptions, and heat from radioactive decay. On earth today, we are shielded from the effects of solar ultraviolet radiation by a layer of ozone gas (O_3) in the upper atmosphere, and it is particularly difficult to imagine the enormous flux of ultraviolet energy to which the early earth's surface must have been exposed. Subjected to ultraviolet energy and to the other sources of energy as well, the gases of the early earth's atmosphere unlimited.

Exercises

Exercise 1. Pronounce and remember the following:

Refer-тегишли
Oxygen-кислород
Probably-балки, эҳтимол
Volcanic eruption-вулқон отилиши
Expose-фош этмок
Associate-қўшмоқ, соединять
Ultraviolet energy-ультра бинафша энергия

Exercise 2. Form the new words with the help of suffixes. Translate the words.
Compose, gas, sign, earth, approximate, particular, agree, image, radiate.

Exercise 3. Translate the following into Uzbek or Russian:
Hydrogen, nitrogen, oxygen, living organisms, approximately, radioactive decay, enormous flux, particularly.

Exercise 4. Translate the following into English.
Вулқон отилиши, ҳаёт ривожланиши, ҳосил бўлмоқ, газли кислород, мунозара, ҳаёт келиб чиқиши сабаблари.

Exercise 5. Make up sentences from the following.

1. present, gas, oxygen, if any, was, little, there.
2. evolution, of life, a reducing atmosphere, the first step, in the, occurred.
3. times, were, violent, those.
4. of the early earth, was, the atmosphere, in hydrogen.
5. carbon dioxide, of, contained, and water, also, if.
6. lessons, I, private, myself, had, with.
7. the edge, to, I, walked, platform, of the.
8. oxygen, gas, little, of any, present, there was.

Exercise 6. Translate the sentences paying attention to grammar.

1. There was little of any oxygen gas present.
2. Those were violent times.
3. Our atmosphere has since changed.
4. These compounds would have been hydrogen, sulfide, ammonia and methane.
5. On earth today we are shielded from the effects of solar ultraviolet radiation by a layer of ozone gas (O₃).
6. It will take me an hour or two to work a sketch for you.
7. He had never heard of these famous chemists.
8. She studied these substances in silence.

Exercise 7. Make up some questions the answers of which are the following.

1. It contained significant amounts of carbon dioxide and water.
2. The atmosphere of the early earth was rich in hydrogen.
3. There was little oxygen present.

4. On earth today we are shielded from the effects of solar radiation.
5. Those were violent times.
6. Our atmosphere has since changed.
7. Amino-acids are colourless solids.
8. Water may be transformed into steam.

Exercise 8. Answer the following questions.

1. What is the difference between the expressions “earth” and “land”?
2. What was early earth composed of?
3. How much oxygen is there in our atmosphere now?
4. Was there more or less oxygen at the early earth?
5. Where there more oxygen in the time of early earth or less?
6. What can you say about the atmosphere of the past?
7. Can you give the definition to the oxygen?
8. What elements does the water consist of?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. All is not gold that glitters.
2. Strike while the iron is hot.

Lipids. Fats.

When organisms store glucose molecules for long periods, they usually convert the glucose into another kind of insoluble molecule that contains more C-H bonds than do carbohydrates. These storage molecules are called fats. The ratio of H to O in carbohydrates is 2:1, but in fat molecules it is much higher. Like starches, fats are insoluble and can therefore be deposited at specific storage locations within the organism. Starches are insoluble because they are long polymers; fats, in contrast, are insoluble because they are nonpolar. Unlike the H-O bonds of water, the C-H bonds of carbohydrates and fats are nonpolar and cannot form hydrogen bonds. Because fat molecules contain a large number of C-H bonds, they are hydrophobically excluded by water because water molecules tend to form hydrogen bonds with other water molecules. The result is that the fat molecules cluster together, insoluble in water.

Fats are one kind of lipid, a loosely defined group of molecules that are insoluble in water but soluble in oil. Oils such as olive oil, corn oil and coconut oil are also lipids, as are waxes such as bee’s wax and ear wax. Fats are composite molecules, each made up of two kinds of subunits:

1. Glycerol. A three-carbon alcohol, each of whose carbons bears a hydroxyl group. The three carbons form the backbone of the fat molecule, to which three fatty acids are attached.
2. Fatty acids. Long hydrocarbon chains ending in a carboxyl (-COOH) group. Three fatty acids are attached to each glycerol backbone.

Exercises

Exercise 1. Pronounce and remember the following:

Store-жамламоқ, тўпламоқ

Convert-ўзгартирмоқ, айлантирмоқ

Location-жойлашиш

Cluster-қобик

Soluble-эрийдиган

Acid-кислота

Attach-бирикмоқ

Starch-крахмал

Exercise 2. Form the new words with the help of suffixes. Translate the words.
Organ, usual, store, hydro, soluble, fat, compose, form, high.

Exercise 3. Translate the following into Uzbek or Russian:
Long periods, olive oil, corn oil, contain, nonpolar, long polymers, storage, within the organism.

Exercise 4. Translate the following into English.
Ёғли кислота, ҳосил қилади, бириктирмоқ, эрмайдиган, аксинча, қобик.

Exercise 5. Make up sentences from the following.

1. is, in water, it, insoluble.
2. each molecule, of subunits, of two, made up.
3. backbone, glycerol, to each, attached, are, acids, fatty, three.
4. because, starches, are, they, insoluble, are, long, polymers.
5. periods, long, for, molecules, glucose, store, organisms.
6. insoluble, starches, are.
7. a carboxyl group, ending, long hydrocarbon chains, in, a.
8. what, composed of, the early, was, earth.

Exercise 6. Translate the sentences paying attention to the predicate in the sentence.

1. The ratio of H to O in carbohydrates is 2:1.
2. The result is that the fat molecules cluster together, insoluble in water.
3. Oils such as olive oil, corn oil are also lipids.
4. Three fatty acids are attached to each glycerol backbone.
5. These storage molecules are called fats.
6. Almost all that we learn comes to us through vision.
7. The invention of the telescope enables man to increase the range of his eyesight.

Exercise 7. Make up some questions the answers of which are the following.

1. Starches are insoluble.
2. The ratio of H to O in carbohydrates is 2:1.

3. They usually convert the glucose into another kind of insoluble molecule.
4. Long hydrocarbon chains ending in a carboxyl group.
5. They are made up of three fatty acids molecules coupled in a dehydration reaction.
6. Seeing plays an important part in helping learn.
7. Galileo the great Italian scientist was one of the first to construct such an instrument.
8. It is light that is reflected from the surface of an object to our eyes.

Exercise 8. Answer the following questions.

1. When do the organisms convert the glucose into another kind of molecule?
2. What is fat?
3. Why are the fats insoluble?
4. How many subunits are the fats composed of?
5. What do you know about glycerol?
6. What does organic chemistry study?
7. What do all living creatures consist of mostly?
8. What are the changes in the polymer industry nowadays?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. There is a slip between the cup and the lip.
2. There is no smoke without fire.

The puzzle of the origin of proteins

It is not clear how in the dilute, nonliving (prevital) soup of the early earth the more complex molecules characteristic of life were formed. Among the many questions that arise, one is particularly significant: *how did amino acids aggregate spontaneously to form the first proteins?* The question is a puzzle because it seems to defy what we know of the laws of chemistry. Biological proteins form by the joining of subunits into chains. The addition of each element to the growing chain requires the input of energy and the removal of a water molecule. This addition is accomplished by the removal of an -OH group from the end of the chain and an -H from the incoming element. Because this reaction is chemically reversible, an excess of water should in principle drive the reaction in the direction of breakdown of the molecule rather than synthesis. The puzzle is that these reactions critical to the evolution of life are thought to have taken place within the oceans and therefore in a high excess of water. It is difficult to imagine that the spontaneous formation of proteins could have occurred under these conditions.

It has been suggested that the first proteins may have formed on the surfaces present within silicate clays. The interior of clays such as kaolinite is made up of thin layers, only 0.71 nanometer apart, separated by water. A nanometer is a billionth of a meter (10^{-9} meter). Thus a cube of kaolinite 1 centimeter on a side has a surface area of 2800 square meters! A one-pound lump would have a surface

greater than 50 football fields. Clay would thus have provided ample surfaces for protein formation to occur. In addition there are many positive and negative charges on the surfaces of these layers, which would have facilitated the process. Supporting the hypothesis that clays may have played an important role in the origin of life, clays such as kaolinite have been shown to catalyze the formation of long polypeptide chains from amino acids when the amino acids are first joined to adenosine monophosphate (AMP), a molecule that produces the energy that makes the reaction possible. This same initial joining of amino acids to AMP is universally employed by all living systems in their synthesis of proteins.

Exercises

Exercise 1. Pronounce and remember the following:

Form-хосил бўлмоқ, образoваться

Chain-занжир, цепочка

Require-талаб қилмоқ, требовать

Evolution-ривожланиш, эволюция

Initial joining-бирламчи боғланиш, первоначальное соединение

Level-даража, уровень

Origin-келиб чиқиши, происходить

Dilute-аралаштирмоқ, разводить

Spontaneous-ўз-ўзидан, самопроизвольный

Exercise 2. Form the new words with the help of suffixes. Translate the words. To live, to defy, element, to react, lay, origin, spontaneous, civil.

Exercise 3. Translate the following into Uzbek or Russian:

Complex molecules, amino acids, the law of chemistry, growing chain, evolution of life, nonliving, spaces for water, positive and negative.

Exercise 4. Translate the following into English.

Денгиз йўли (морской путь), қирғoқ (берег), ўшиш даражаси (уровень эволюции), топишмоқ (загадка), ажрашмоқ (отделяться), сув молекуласи (молекула воды), муҳим ўрин (важная роль).

Exercise 5. Make up the sentences from the following.

1. the first proteins, spontaneously, amino acids, to form, how, aggregate, did?
2. into, proteins, biological, form, chains, by the joining.
3. that, suggested, it has been, the first, on the surfaces, clays, proteins, silicate clays, present, within.
4. in chunks, the layers of clay, one on another, are stacked.
5. for water and other substances, provide, are and spaces, enormous surface, provide.
6. nitrous acids, with, react, they.
7. vegetable, the most, is, country, this, sufficient.
8. ethanol, refer to, to which, chemical group, does?

Exercise 6. Translate the sentences paying attention to the structure of the words in the sentence.

1. The addition of each element to the growing chain requires the output of energy.
2. The interior of clays such as kaolinite is made up of thin layers.
3. OH group from the end of the chain and an H from the incoming element.
4. The puzzle is that these reactions critical to the evolution of life are thought to have taken place within the oceans.
5. Just how light travels through space we cannot really say.
6. With his crude telescope he made many discoveries concerning the heavenly bodies.
7. It is light that is reflected from the surface of an object to our eyes.

Exercise 7. Make up some questions the answers of which are the following.

1. The nucleus of an atom may be compared to magnet.
2. Water may be transformed into steam.
3. A substance can be transformed from the liquid state into the solid.
4. Kaolinite is made up of thin layers.
5. The layers of clay are stacked in chunks.
6. She studied her face in silence for some time.
7. The elements on this table were divided into groups of ten.
8. They are supposed to have existed from as early as 200 B.C. down to about the year 1000 A.D.

Exercise 8. Answer the following questions.

1. How do amino acids aggregate spontaneously to form the first proteins?
2. How long is a nanometer?
3. What is AMP?
4. How many times do the layers of clay magnify?
5. What do you know about proteins?
6. Can people use proteins in real life?
7. Have you ever used nanometers at your experiments?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. A good beginning is half the battle.
2. Human existence is full of mystery.

Organic chemistry in the everyday life

Organic chemistry touches every aspect of your life. This includes such areas as the clothes you wear, the food you eat and the car you drive. Common to each of these items are chemical compounds based on the element carbon. Organic

chemistry has both positive and negative attributes, and organic chemistry involves you.

All living creatures, both plant and animal, consist largely of complex carbon containing molecules. These molecules provide for the day-to-day operation and maintenance of each organism as well as for the continuance of the species. Interestingly, as chemists learned how to synthesize these complex molecules of life and the molecules that interact with them, organic chemistry came back to its roots. A part of the beginnings of organic chemistry was the study of compounds derived from the “organs” of living creatures-thus the name organic chemistry. Now the knowledge gained from that research provides the basis for healing the diseases of many of those organs.

Looking in a totally different direction for the presence of carbon atoms in your life, what can you find that is more commonplace than plastic? You use plastics, or polymers, virtually all day long from the “disposable” packaging of your bath toiletries to the sophisticated polymeric materials in your car and computer. The plastics that make up all these items are based on organic compounds. The polymer industry has impacted modern society more than any other industry.

Exercises

Exercise 1. Pronounce and remember the following:

Touch-тегишли

Living creature-тирик жониворлар

Totally-умуман

Day to day-кундан-кунга

Provide-таъминламоқ

Based on-асосланган

Direction-йўналиш

Exercise 2. Form the new words with the help of suffixes. Translate the words. Organ, chemical, create, main, direct, know, operate, base, life, book.

Exercise 3. Translate the following into Uzbek or Russian:

Continuance, interestingly, come back, research, negative attributes, polymer industry, items.

Exercise 4. Translate the following into English.

Органик кимё. сиз ейдиган овқат,бу нарсаларнинг ҳар бири, замонавий жамият, кундан кунга, умуман, бошқармоқ.

Exercise 5. Make up sentences from the following.

1. carbon, complex, consist of, creature, all living.
2. of your life, chemistry, every aspect, organic, touches.
3. backbone, glycerol, to each, attached, are, acids fatty, three.

4. other industry, any, more, modern society, has impacted, industry, the polymer.
5. ever, you heard, proverb, this?
6. been advanced, theories, have, several.
7. the first, was, to, Galileo, construct, person.
8. study, what, organic, does, chemistry?

Exercise 6. Translate the sentences paying attention to the attribute and object used in the sentence.

1. All living creatures, both plant and animal consist largely of complex carbon containing molecules.
2. Organic chemistry came back to its roots.
3. Now the knowledge gained from that research provides the basis for healing the diseases of many of those organs.
4. Fats are one kind of lipid.
5. Finding this took up too much of the time I had to spare for study.
6. I had only one year is instruction in a Latin school.
7. The study of social functions of chemistry has for along time occupied an important place in science.
8. We must distinguish two sub-questions, and rule out one of them.

Exercise 7. Make up some questions the answers of which are the following.

1. Organic chemistry touches every aspect of our life.
2. Organic chemistry has both negative and positive attributes.
3. All living creatures both plant and animals consist of complex carbon.
4. The polymer industry has impacted modern society more than any other industry.
5. Most chemical communication does not serve that purpose
6. We should verification as a primitive semantic operations.
7. There is a more important conclusion to be drawn from our experiment of the evolution of molecules.

Exercise 8. Answer the following questions.

1. What does organic chemistry study?
2. Where can we see organic chemicals?
3. What do all living creatures consist of mostly?
4. What are the changes in the polymer industry nowadays?
5. Do you think that foreign languages connected with science?
6. What is difference between organic and anorganic chemistry?
7. What are the functions of fats?
8. What directions are provided in the organic chemistry?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. He that nothing asks, nothing learns.
2. Inner beauty is more important than physical beauty.

A chemical laboratory

Any laboratory is a place devoted to experimental study in any branch of science for the purpose of advancing man's knowledge or to application of scientific principles in testing and analyses. Chemists prepare drugs, make chemical substances for industry, for textiles, home life and so on there.

Here is a description of a chemical laboratory of an institute.

The room is light and well ventilated. The ventilators are near the door opposite the windows.

There are twenty laboratory tables here, besides the demonstration table which stands between the two rows of tables and in front of them. Each table has gas, water and electricity connections. There are forty work-places, two at each table. So, two students can work at one table in the lab at a time. The lab accommodates about forty students.

The laboratory has different gases, including illuminating gas, oxygen and hydrogen. Oxygen and hydrogen are kept in heavy steel tanks under high pressure.

The table tops have one or two holes in them connected to the suction fan for carrying off fumes and gases. They slope a little from both sides to the central line to carry off the wastes. The wide table tops are impervious to water and acids. Alabaster is excellent material for such purposes.

Bottles with reagents are on the upper shelves along the walls. Beneath them on the lower shelves students keep their bath-tubes, spirit lamps, filter paper and necessary chemicals. Among the subjects students study in the laboratory are density, viscosity, vapour pressure and others. Our country needs specialists in industry, science and agriculture. Many skilful industrial workers, engineers and scientists carry on important work in laboratories fitted up for conducting scientific experiments including chemical and physical processes.

Exercises

Exercise 1. Pronounce and remember the following:

experimental study-тажрибавий иш

illuminating gas-ёритувчи газ

spirit lamp-спиртовка

suction fan-тортувчи вентилятор

pressure-босим

carry off-утказмок, бажармок

at a time-бир вақтнинг узида

Exercise 2. Form the new words with the help of suffixes. Translate the words. Found, construct, wide, unite, reach, divide, commerce, design, form, represent, nature.

Exercise 3. Translate the following into Uzbek or Russian:

Were built upon piles, graphic reconstruction, naval fleet, increasing, quadrangular perimeter

Exercise 4. Translate the following into English.

Окаетган сув, ичимлик суви, ташки куринишни йукотиш, тез ушиб боради, пробирка, кимёвий жихоз

Exercise 5. Make up sentences from the following.

1. there, many, are, experiments, carried out.
2. are, the rooms, light, of the laboratory.
3. well, are ventilated, they.
4. and, electricity conditions, water, gas, has, table, each.
5. our, next year, be, opened, new lab, will.
6. two, there, other, are, kinds, evidence, of, that, be, can, drawn, discussing, in, upon, the, origin, language, of.

Exercise 6. Translate the sentences paying attention to the attribute and object used in the sentence.

1. Learning English riddles and proverbs is useful.
2. We use water for drinking.
3. Our students are carrying an important work in laboratories fitted up for conducting scientific work.
4. Any lab is a place devoted to experimental study.
5. Nowadays labs are introduced into educational institutions to teach scientific knowledge.
6. Some labs have departments devoted to research in pure sciences.

Exercise 7. Make up some questions the answers of which are the following.

1. He is making an experiment.
2. This lab is very light for the experiment.
3. We usually light the room when it gets dark.
4. Research work is carried out for the purpose of advancing man's knowledge.
5. I like to be in the laboratory.
6. This experiment has been carrying for th

Exercise 8. Answer the following questions.

1. What is a chemical laboratory?
2. What is any laboratory devoted to?
3. What do chemists prepare?
4. What tops have laboratory tables?
5. Why are the table tops made of stone?
6. Why must the tops of the tables slope a little?
7. What do students keep on the shelves?
8. How are oxygen and hydrogen kept?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Slow to promise and quick to perform.
2. What the heart thinks the tongue speaks.

Metal borohydrides

The discovery of metal borohydrides proved to be extremely interesting. Many metal borohydrides distill without decomposition, so that they can be obtained in a state of high purity. They are used as reducing agents and as a source of hydrogen.

Certain borohydrides are well known, e.g. lithium, beryllium and aluminium borohydrides. Aluminium borohydride is an extremely reactive compound. It is a liquid which reacts vigorously both with water and hydrogen chloride to liberate hydrogen. It evolves hydrogen at room temperature and builds up pressure in storage containers. Storage areas should be kept free of oxidizing agents. The vapour of aluminium borohydride detonates violently and spontaneously in air containing only traces of moisture. No reaction occurs with dry air. Steel cylinders have been found to be most satisfactory for storage.

Aluminium borohydride, similarly to the other boron compounds, has aroused interest in its use as a rocket propellant. Besides a high rate of heat release and steady burning, it has a high jet velocity. Theoretical calculations show that an aluminium borohydride-chlorine trifluoride propellant system can give a specific impulse of 266 sec. with a combustion chamber pressure of 300 psi and nozzle exit pressure of 14.7 psi.

Beryllium borohydride is a solid material. The compound is soluble in organic solvents, including nonpolar solvents like benzene. It reacts vigorously with water and other reducing agents. Aluminium and beryllium borohydrides are of a weak ionic character and vigorously ignite when exposed to air. Like other borohydrides, they hydrolyze easily in water, generating hydrogen. Beryllium borohydride is a dangerous fire hazard. It is spontaneously inflammable in air. It is toxic when heated to decomposition, it emits highly toxic fumes of beryllium oxide.

Lithium borohydride is attractive as a source of hydrogen since it contains almost 19 per cent by weight of hydrogen. The hydrolysis of 1 lb. of lithium borohydride yields 66 ft of hydrogen. It appears in the form of orthorhombic crystals which are stable under ordinary conditions but decompose in moist air.

Exercises

Exercise 1. Pronounce and remember the following:

Discovery-

Distill-

Vigorously-

Evolves-

Vapour-

Combustion-

Propellant-

Velocity-

Exercise 2. Form the new words with the help of suffixes. Translate the words. Compose, discover, extreme, store, satisfy, react, appear.

Exercise 3. Translate the following into Uzbek or Russian:

Extremely, to liberate, occurs, similarly, a high rate, pressure, attractive, spontaneously.

Exercise 4. Translate the following into English.

Хар хил, аста-секин, ўраб олмоқ, шубҳасиз, ҳимоя қилмоқ, эҳтимол, ривожланмоқ

Exercise 5. Make up sentences from the following.

1. against, the sea, the long chain, formed, of sand dunes, a barrier, at those times.
2. was, it, is, development, possible, first, due, Ravenna's quite, that, strong, to maritime, urge, to Marius.
3. lives, near, Ann, Institute, the.
4. when, you, to, University, do, go, the?
5. one, the, beautiful, Baikal, on, world, is, of, most, lakes, are.
6. have, the origin, been, men, debate, of, the very, from earliest, language, times.

Exercise 6. Translate the sentences paying attention to the attribute and object used in the sentence.

1. Men have been debating the origin of language from the earliest times.
2. He said that there would be built many new houses.
3. Nick said that ancient cities would be restored.
4. We were welcomed by a group of students.
5. The best way to remember things is to join them in our mind with something which we know.
6. He must invent the part before class to go along.

Exercise 7. Make up some questions the answers of which are the following.

1. Steel cylinders have been found to be moist satisfactory for storage.
2. It is spontaneously inflammable in air.
3. The first thing need was a porter.
4. It was cool, lovely June.
5. Some years ago I made up my mind to go on a sketching tour through Spain.
6. Buildings began to arise outside.

Exercise 8. Answer the following questions.

1. What did you learn from this text?
2. Where metal borohydrides can be found mostly?
3. When are these elements toxic?
4. In what form do the borohydrides appear?
5. Why do many metal borohydrides distill without decomposition?

Exercise 9. Retell the text.

Exercise 10. Give the situations in which these proverbs can be used:

1. Don't put all your eggs in one basket.
2. All men are poets at heart.

Additional texts

Optics

Have you ever heard the old saying, “seeing is believing”. Perhaps you think that it is not always true. Nevertheless, “seeing” does play an important part in helping learn. Scientists have found that we learn more through our eyes than through our four other senses combined. In fact, almost all that we learn comes to us through vision. We cannot see unless there is light. It is the light that is reflected from the surface of an object to our eyes that makes the substance visible. Just how light travels through space we cannot really say. Several theories have been advanced, each of which has points of merit, but no theory has yet been proposed that accords with all the known properties of light.

The invention of the telescope in 1609 enables man to increase the range of his natural eyesight. Galileo, the great Italian scientist was one of the first to construct such an instrument. With his crude telescope, he made many discoveries concerning the heavenly bodies, and became convinced that Copernicus was right when he advanced the revolutionary idea that the sun is the centre of our solar system. What progress has been made since the time of Galileo in the construction of optical instruments! Today the eyes of the world are turned to the greatest optical instrument, the telescope. What distant stars will be brought within the range of our vision with this remarkable instrument; it is expected that the telescope will enable us to see stars so distant from us that it has taken a billion years for the light from them to reach us here on earth. Not only the distant, but also the “near at hand can be seen more clearly by combinations of lenses. Microscopes reveal to us the arrangement of the particles in a piece of steel, the structure of plant and animal cells, and the existence of minute forms of life such as protozoa and bacteria. In our daily life we make practical use of simple optical instruments. We use a mirror when combing our hair. Many of you see an object accelerating, there must be an external force acting on the object because, as stated in Newton’s first law, objects move at a constant velocity unless acted upon by an outside force.

Mathematically, Newton’s second law of motion can be expressed by the following formula: $a = F/m$ where a is the acceleration, F is the force, and m is the mass.

What this formula tells us is that force causes an object to accelerate. However, it also tells us that the acceleration an object feels, its response to an applied force, does not solely depend on the amount of force applied. It also depends on the mass or inertia of that object. It also tells us that the more mass an object has, the less it accelerates in response to an applied force. This makes intuitive sense. For instance, if I apply the same force to a cotton ball and an elephant, the cotton ball would experience a greater acceleration than the elephant because the elephant has much more mass or inertia. Therefore, an object with a greater mass has a better tendency to resist a change in its motion when an external force is applied to that object. In other words, we say that the elephant has more inertia than the cotton

ball.

Part of the beauty of math is that all this can be elicited from looking at the formula above in a much more compact form without reading an entire paragraph of explanation.

Third Law of Motion

Newton's third law states that whenever a force is exerted, an equal and opposite force arises in reaction to this force. In other words, every force has an equal and opposite reaction force.

So, if Newton's third law is true, and the wall pushes back on us just as hard as we push back on it, there must be some way of seeing that in the real world. Well, there certainly is. If you have ever gone ice skating or in-line skating or roller skating, you can probably recall the example to follow.

The only reason why you didn't move when you pushed against the wall is because there is friction pushing you back to the right. Well, if you go skating, ice skating for example, between you and the floor because ice is very slippery. As a result, there isn't enough friction to compensate for the wall pushing you back. If you push against the wall while ice skating, you will move backwards as a result of the reaction force to you pushing against the wall.

An object that is at rest will remain at rest unless a nonzero net (or total) force is exerted on it. This one is fairly easy to believe and sounds intuitive enough. However, the next part of the first law might sound less plausible. Simply stated, an object moving at a constant velocity will continue to move at a constant velocity (moving at a constant speed and in a straight line) unless a nonzero net (total) force acts upon the object. Recall that constant velocity means that the object is moving at a constant speed and in a constant direction.

At this point, you might be thinking to yourself about something you saw in the world that contradicts the statement I just made. For instance, think of a car rolling in a straight line while in neutral. If what I stated above were true, then the car should be able to roll in a straight line at a constant speed forever. This is obviously not true in real life because everyone knows the car eventually comes to stop. This certainly seems to prove that Newton's first law of motion is false. Or does it? I assert that the observation is consistent with Newton's first law which states that an object moving at a constant velocity will continue moving in that fashion unless a nonzero net force acts upon that object. You might already know the answer.

It is true that the car would continue to move in a straight line at a constant speed if there was no net force acting on the car. However, is there really no net force acting on the car? In fact, there is nonzero net force acting on the car, causing it to slow down. And, you probably already know what that force is. The force responsible for slowing down the car is friction. Therefore, the above observation about a car slowing down while in neutral is not inconsistent with Newton's first law of motion. It just seems to contradict it at first. If this is confusing, pause for a

moment and think about it for awhile.

This is a pretty surprising fact to most people when they first hear it. If we were able to remove all the friction between the ground and a ball, once you start the ball rolling, it would roll on forever in a straight line. This is a perfect tie-in to Newton's second law. We just discovered that objects like to move in straight lines and at constant speeds unless a force acts upon them. In fact, when a force acts on an object, the force causes the object to change its velocity. In other words, forces cause objects to.

Let's consider three main definitions we always use to describe a body's motion.

Speed

Speed describes how fast something is moving. A simple example would be to look at your car's speedometer while you are driving. This tells you the speed at which you are travelling. Notice that when you look your car's speedometer, it only tells you the speed at which you are traveling. It does not tell you the direction in which you are traveling. Of course, this seems obvious to anyone who drives a car, but I just wanted to make the point that speed does not involve a direction.

How does speed describe motion? Well, this is also fairly obvious. For instance, when a car is moving at safe and legal speed of 55 mph (miles per hour), it will travel a distance of 55 miles in one hour of time. If it were moving at a speed of 100 mph, it would travel a distance of 100 miles in one hour of time. No surprises here.

Next, let me define something called average speed. Average speed is defined as follows. *Average Speed = [Taken to Travel that Distance]*

For instance, let's say that it takes you 2 hours to travel a distance of 100 miles. Using the above formula, your average speed during those 2 hours would be 50 miles/hour or 50 mph. This is because 100 miles divided by 2 hours is 50 miles/hour.

Next, let's contrast average speed to instantaneous speed. Well, as you might have guessed, instantaneous speed is the speed at which you are currently traveling at the moment. For instance, if you are driving along and look down at the speedometer, your instantaneous speed at that moment would be what was displayed on your speedometer.

So, how does instantaneous speed differ from average speed? Well, let's go back to the example above. One way to get an average speed of 50 mph over 2 hours would be to simply drive at 50 mph all the time. In this case, the average speed would be the same as the instantaneous speed. However, let's say your foot is not the steadiest part of your body. If this is true, then your instantaneous speed would fluctuate a lot. However, if you still manage to cover 100 miles in 2 hours, even though your speed was fluctuating, then your average speed would still be 50 mph, but your instantaneous speed during those two hours of driving would not

always be 50 mph.

Let me give a concrete example to illustrate this point. Let's say you drive at 25 mph for the first hour and then you drive at 75 mph for the second hour. In this case, your instantaneous speed during the first hour would be 25 mph at any moment. Your instantaneous speed during the second hour would be 75 mph at any moment. However, if you average those speeds (add them up and divide 'by two), you will find that the average speed was 50 mph. [hope this serves to illustrate the difference between instantaneous and average speed.

The story of electricity

There is electricity everywhere in the world. *U* is present in the atom, whose particles are held together by its forces; it reaches us from the most distant parts of the universe in the form of electro-magnetic waves. Yet we have no organs that could recognize it as we see light or hear sound. We have to make it visible, tangible, or: audible, we have to make it perform work to become aware of its presence. There is only one natural phenomenon which demonstrates it unmistakably to our senses of seeing and hearing — thunder and lightning; but we recognize only the effects — not the force which causes them.

Small wonder, then, that Man lived for ages on this earth without knowing anything about electricity. He tried to explain the phenomenon of the thunderstorm to himself by imagining that some gods or other supernatural creatures were giving vent to their heavenly anger,' or were fighting battles in the sky. Thunderstorms frightened our primitive ancestors; they should have been grateful to them instead because lightning gave them their first fires, and thus opened to them the road to civilization. It is a fascinating question how differently life on earth would have developed if we had an organ for electricity were giving vent to their heavenly anger .

Edison's lighting system

It was only in the last quarter of the nineteenth century, that electricity began to play its part in modern civilization, and the man who achieved more in this field of practical engineering than any of his contemporaries was the American inventor, Thomas Alva Edison. His dramatic career is too well known, and has then described too often, to be told again; it may suffice to recall that he became interested in the problem of electric lighting in 1877, and began to tackle it with the systematic energy which' distinguished him from so many other inventors of his time. Edison was no scientist and never bothered much about theories and fundamental laws of Nature; he was a technician pure and simple, and a very good business man as well

He knew what had been done in the field of electric lighting before his time, and he had seen some appliances of his contemporaries, such as the arc-lamp illuminations which had been installed here and there. Two sticks of carbon, nearly

touching, can be made to produce an electric arc which closes the circuit. Many scientists and inventors who tried to tackle the problem were therefore convinced electric light — produced by some substance glowing in a vacuum so that it cannot burn up — could ever replace gas lighting, then the universal system of illumination in Europe and America.

Edison put his entire laboratories at Menlo Park *to* the task of developing such a lamp. The most important question was that of a suitable material for the filament. He experimented with wires of various metals, bamboo fibre, human hair, paper; everything was carbonized and tried out in glass bulbs from which the air had been exhausted it is said that a button hanging loose from its thread on his jacket gave him the idea

Well, the curtain has finally been drawn back, and the reason for the ubiquitous use of the constant downward acceleration of 10 (meters/5sec)/sec is finally at hand. And, just think, all you have to do is drop something, and you can witness it.

I am, of course, speaking of gravity, which you might have guessed from the title of this section. For situations near the surface of the earth, it turns out that gravity causes objects to accelerate downward at almost 10 (m/sec)/sec. The actual acceleration is 9.81 (m/sec)/sec downward. I've just been using 10 (mi/sec)/sec because it's an easier number to work with. So, the good news is that all those examples involving throwing a ball that experiences a constant downward acceleration haven't really gone to waste. The only thing new we learned is the force behind it. We now know it was gravity all along that was causing the ball to accelerate downward at a constant acceleration. I am sure you suspected as much.

Well, it turns out that the acceleration due to gravity is so popular that people have given it a special name. We usually associate the letter *g* with the acceleration due to gravity.

In other words, $g = 9.81$ (meters/sec)/sec downward is the acceleration due to gravity. Notice that this is another example of a constant acceleration. The force of gravity (near the earth's surface) causes objects to accelerate downward at a constant 9.81 (meters/sec)/sec. In other words, the force of gravity (near the earth's surface) causes objects to experience a change in their velocity of 9.81 meter/sec downward for every second. If you need a reminder about constant acceleration, please refer to this section. Make sure you really understand the idea of a constant acceleration before proceeding.

A common mistake some people make is saying that *g* is gravity. We know this isn't the case because gravity is a force and not an acceleration, whereas *g* is the acceleration an object experiences in response to the force of gravity (near the earth's surface).

(As an aside, when fighter pilots speak of pulling *g*'s, this is the *g* of which they speak.)

Well, let's go ahead and do some problems to see how you might use your newfound knowledge. In the following problems, assume there is gravity and that we are near the surface of the earth.

Let's say you are standing next to a cliff and decide to drop a ball. What is the velocity after 4 seconds? Now, there is really nothing new here. You've done these problems before. You can either use the velocity formula or just the fact that the ball experiences a constant acceleration to solve this problem. Try doing it both ways if you are out of practice.

The answer you should get is that, after 4 seconds, the ball is moving' downward at a speed of 39.24 m/sec.

For objects near the surface of the earth, gravity causes objects to accelerate downward at a constant 9.81 (m/sec)/sec. Recalling the constant acceleration section, this means that gravity causes an object's velocity to change by 9.81 m/sec downward for every second the object is under the influence of gravity,

Well, we've just spent an entire section talking about the effects of gravity near the earth's surface. We found out that, near the surface of the earth, gravity causes all objects to accelerate downward at a constant rate of $g = 9.81 \text{ (m/sec)/sec}$. In addition, we also saw that, near the surface of the earth, your weight is just the force of gravity pulling you downward. Finally, there was the startling, revelation that the acceleration due to gravity wasn't really constant. It just changed little enough near the surface of the earth that we could assume the acceleration was constant. We will discuss this last point in more detail later.

There was something, however, that was quite unsatisfying about the previous discussion. Though we were able to calculate the force of gravity and predict its effects on objects, we never really got to the source of it. What is the source of gravity and what types of objects does it affect? In addition, how does it affect objects in general, not just near the surface of the earth?

Simply put, gravity is the attraction between any two objects that have mass. For instance, the earth and the moon are attracted toward each other because they both have mass. Likewise, the sun and the earth are attracted toward each other.

Types and shapes of leaves

Leaves occupy various positions on the stem and branches, and have received different names according to their situation. Thus, leaves arising from an unelongated crowned stem so they appear to be coming from the root, as in the Plantain or Dandelion, are called radical, those on the stem are cauline, on flower stalks floral leaves. In their arrangement leaves follow a definite order. The places on the stem at which leaves appear are called nodes; the part of the stem between two nodes is the internode. When two leaves are produced at the same node, one on each side of the stem or axis, and at the same level, they are opposite; when more than two are produced they are verticillate, and the circle of leaves is then called vertical or whorl. When leaves are arranged one after another they are called alternate following thus a law of alternation. When leaves are opposite, each successive pair may be placed at right angles to the pair immediately preceding they are decussate. Leaves may be of different shapes such as ovate, elliptical, lanceolate, linear, cordate, kidney-shaped, wedge-shaped, orbicular and obovate.

The sloth

The sloth is destined by nature to be produced, to live and to die in the trees. His fore-legs, or more correctly speaking, his arms, are apparently much too long, while his hind-legs are very short and look as if they could be bent almost to the shape of a cork-screw. Both the fore and hind legs, by their form, and by the manner in which they are joined to the body, are quite incapacitated from acting in a perpendicular direction, or in supporting it on the earth, as the bodies of other quadrupeds are supported by their legs. Hence, when you place him on the floor, his belly touches the ground. Were he to support himself on his legs like other animals, nevertheless he would in pain, for he has no soles to his feet, and his claws are very sharp and long, and curved; so that, were his body supported by his feet, it would be by their extremities, just as your body would be, were you to throw yourself on all fours, and try to support it on the ends of your toes and fingers a trying position. Were the floor of glass, or of a polished surface, the sloth would actually be quite stationary; but as the ground is generally rough, with little protuberances upon it, such as stones, or roots of grass, etc., this just suits the sloth, and he moves his fore-legs in all directions, in order to find something to lay hold of; and when he has succeeded, he pulls himself forward, and is thus enabled to travel onwards, but at the same time in so tardy and awkward a manner, as to acquire him the name of Sloth.

Some years ago I kept a sloth in my room for several months. I often took him out of the house and placed him upon the ground, in order to have an opportunity of observing his motions. If the ground was rough, he would pull himself forward, by means of his fore-legs, at a pretty good pace; and he invariably immediately shaped his course towards the nearest tree. But, if I put him upon a smooth and well-trodden part of the road, he appeared in trouble and distress; his favourite abode was the back of a chair; and after getting all his legs in a line upon the top-most part of it, he would hang there four hours together, and often with a low cry would seem to invite me to take notice of him.

The sloth, in its wild state, spends its whole life in trees; and not upon the branches, like the squirrel and the monkey, but under them. He moves suspended from the branch, he rests suspended from it, and he sleeps suspended from it. To enable him to do this, he must have a very different formation from that of any other quadruped.

It must be observed that the sloth does not hang head downwards like the vampire. When asleep, he supports himself from a branch parallel to the earth. He first seizes the branch with one arm, and then with the other; and after that, brings up both his legs, one by one, to the same branch; so that all four are in line: he seems perfectly at rest in this position. Had he a tail, he would be at a loss to know what to do with it in this position; were he to draw it up within his legs, it would interfere with them, and were he to let it hang down, it would become the sport of the winds. Thus his deficiency of tail is a benefit to him: it is merely an apology for a tail, scarcely exceeding an inch and a half in length.

If we examine the anatomy of his fore-legs, we shall immediately perceive by their firm and muscular texture, how very capable they are supporting the pendent weight of his body, both in climbing and at rest, and we shall consider them as remarkably well calculated to perform their extraordinary functions.

There is a saying amongst the Indians, that when the wind blows, the sloth begins to travel. In calm weather he remains tranquil, probably not liking to cling to the brittle extremity of the branches, lest they should break with him in passing from one tree to another; but as soon as the wind rises, the branches of the neighbouring trees become interwoven, and then the sloth seizes hold of them, and pursues his journey in safety. There is seldom an entire day of calm in these forests. The trade-wind generally sets in about ten o'clock in the morning, and thus the sloth may set off after breakfast, and get a considerable way before dinner. He travels at a good pace; and were you to see him pass from tree to tree, as I have done, you would never think of calling him a sloth.

The rabbit

The rabbit may be studied as a type of the hairy quadrupeds. The animals of this kind are called "mammals", as their young are nourished on their mother's milk.

Wild rabbits live in burrows or underground passages they excavate, by means of their strong feet. They are said to be gregarious, because a great many live together.

Rabbits do not walk and run, in the ordinary sense of the words, but get over the ground by a series of jumps. The great length of their hind legs makes this peculiar method of locomotion very easy, for the sudden straightening of these limbs drives the body upwards and forwards with great force.

Rabbits breed very rapidly; indeed it has been estimated that in five years a single pair might have about a million of descendants, if all the offspring lived and became parents when old enough.

The body of the rabbit consists of head, trunk, two pairs of limbs, and a short, upturned tail. The outside of its body is almost entirely covered with a kind of hair, called fur. Fur appears to be especially useful for keeping an animal warm and its skin dry.

The longest hairs of the rabbit are the stiff whiskers which stand out from the upper lip, the cheeks, and above the eyes. They are very sensitive to touch, and are a great help to the animal in finding its way through the dark burrows.

The colour of the wild rabbit is grayish brown, except on the belly and under the tail, where it is white. Anyone can understand that rabbits coloured grayish brown would be less likely to be seen by their enemies than others which happened to be white all over, or black, or spotted with black and white, and therefore they would be more likely to grow up.

The cell

The cell is the unit of life, and it is also the unit of structure in the human body. Cells are so small that they cannot be seen by the naked eye, and we are told that high-powered microscopes are required in order to study them. All cells possess a nucleus; and a cytoplasm. Within the cytoplasm are two kinds of special structures: those which perform special vital functions, and those which are not engaged in carrying on life processes.

The most important of the latter structures are carbohydrates and fats. The carbohydrates are composed of carbon atoms combined with hydrogen and oxygen in the same ratio as that in which they appear in water: hence the name "carbohydrates" which means "carbon with water". The carbohydrates are of three types: single sugars, double sugars and starches. Starch is the form in which carbohydrates are stored. When a cell has more sugar in it that it can immediately use, the sugar is transformed into minute bits of solid starch which remain in the cytoplasm until they are needed. Cells may use carbohydrates in two ways. First, they may undergo chemical changes, usually combination with oxygen, to supply energy for the cell's activities. Second, at least in plants, they may be combined with nitrogen to build up the proteins of the cell structure. Activity, as well as cell structure, is an essential condition of life; and if that activity stops for even a brief period, the cell dies and cannot be revived. But all activity requires energy, and therefore it is very important for a cell to have stored food substances to provide this energy. If these are lacking, however, the cell can oxidize the materials of the protoplasmic structure. Therefore proteins as well as carbohydrates and fats can be utilized as fuel. These three energy-yielding substances are spoken of together as organic foods. Water and mineral salts are called inorganic foods, because they are found in nature apart from life.

The bee

Bees can tell one another where to go to food. Their language is a strange one. It is a language of smells and dancing.

Imagine a bee finds flowers with a lot of sugary nectar in them. But she cannot carry it to the hive alone. How does the bee, which has discovered the nectar, tell the others of the find? People have found it out by making hive with glass window.

Back at the hive the bee that has found the nectar dances for the other bees. The dance is not just any kind but special one. Suppose the flowers are not far, perhaps just 25 yards away. To show this dancing bee does a round dance, first to the right, then to the left. Round a round she goes for as long as a minute. Other bees start dancing with her. Suddenly she stops her dance and gives a little nectar to each bee. Then the bees fly from the hive to find the nectar. But how do they know which flowers to look for.

The discoverer does not lead them; she flies out alone after the dance. The answer is that the discoverer brought back the scent of the rich flower on her body, and during the dance her partners smelt it. The dance and scent make them go out

and look for flowers with that same scent. So, the bees know what kind of nectar to look for. And they know that the flowers are not far away, for the dance was a “round dance”. Suppose the flowers are far away if they are farther than 75 yards away, the bee tells the other bees about it by a different kind of dance. It is a dance in which the bee moves her “tail” from side to side. This is the “tail dance”.

The tail dance not only tells other bees that their nectar is at a distance of more than 75 yards away and in what kind of flowers it is (by the sun). The tail dance tells them much more than this, it gives the exact direction and the exact distance. It is the number of turns per minute that tells the other bees how far is the nectar. For example, for food that is 300 yards away the dancer makes 28 turns per minute, if 3000 yards away she turns only 11 times in the minute. If the flowers are between the hive and the sun the dancing bee faces the sun. If the flowers are the other way she dances with her back to the sun.

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English for masters-II (магистратура боскичи физика, кимё, биология ва
математика йуналишлари талабалари учун услубий ишланма)

Нашрга рухсат берилди:

Нашр этилди:

Хажми : 5 б.т. Адади: 50 нусха