МИНИСТЕРСТВО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
САМАРСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

Кафедра иностранных языков

Л.И. Сологуб

Ботаника на английском

Обязательный материал для чтения на занятиях и дома

Учебное пособие

для студентов первого курса
специальности «биология»

Издательство «Самарский университет»
2001

ББК 28.5 '
С 602

Печатается по решению Редакционно-издательского совета Самарского госуниверситета

Сологуб Л.И, Ботаника на английском. Обязательный материал для чтения на занятиях и дома: Учеб. пособие - Самара, 2001. -72 с.

ISBN 5-86465-205-9

Настоящее учебное пособие предназначается для интенсивной работы с элементарной оригинальной литературой по специальности. QHO включает в себя материалы для устного обсуждения в аудитории: тексты, словарь для запоминания и вопросы. Материал для письменных отчетов дома, переводов и кратких изложений, состоит из 3-х частей. Это тексты с краткими словарными пояснениями, заимствованные из научных журналов, полученные по системе "Интернет".

Автор ориентирует студентов на составление моделей структурно-смысловой организации текстов, что позволяет постепенно переходить к самостоятельному чтению более сложной по содержанию оригинальной литературы по специальности.

Пособие предназначено студентам-биологам первого курса высших учебных заведений в качестве основного содержания обучения. Оно может быть использовано студентами как дневной, так и вечерней форм обучения. Оно может быть полезно всем студентам естественных факультетов, изучающим английский язык.

Автор выражает глубокую признательность и благодарность ст. преп. Т.В. Шуруновой и канд. биол. наук, доц. Л.М. Ковеленовой за часть предоставленных текстовых материалов.

ББК 28.5

Отв. редактор канд. филол. наук, доц. Э.Б. Яковлева
Рецензент д-р филол. наук, проф. О.Д.Наумова

ISBN 5-86465-205-9

I. READING IN CLASS

Text I

I. Read the text and say what it is about

Cells[1]

Nearly all plants and animals have one characteristic in common: they are made up of cells. If any structures from plants or animals are examined microscopically they will be seen to consist of more or less distinct units - cells[2] - which, although too small to be seen with the naked eye, in their vast numbers make up the structures or organs.

Since the cells of any organ are usually specially developed in their size[3], shape[4] and chemistry to carry out[5] one particular function (e. g.[6] muscle[7] cells for contracting[8]) there is, strictly speaking, no such thing as a "typical" cell of plants or animals.

II. Remember the following words and word combinations:

1) cell - клетка
2) unit cell - элементарная ячейка
3) size [saiz] - размер
4) shape [ɵip] - форма
5) carry out ['kæri'aut] - выполнять, осуществлять
6) e.g. - exempli gratia = for example - например
7) muscle ['mʌsl] - мускул, мышца
8) contract [kən'træ kt] - сжимать(ся), сокращать(ся)

III. Suggest the Russian for:

to be made up of ... ; to consist of ... ; strictly speaking; distinct unit cells; to see with the naked eye.

IV. Suggest the English for:

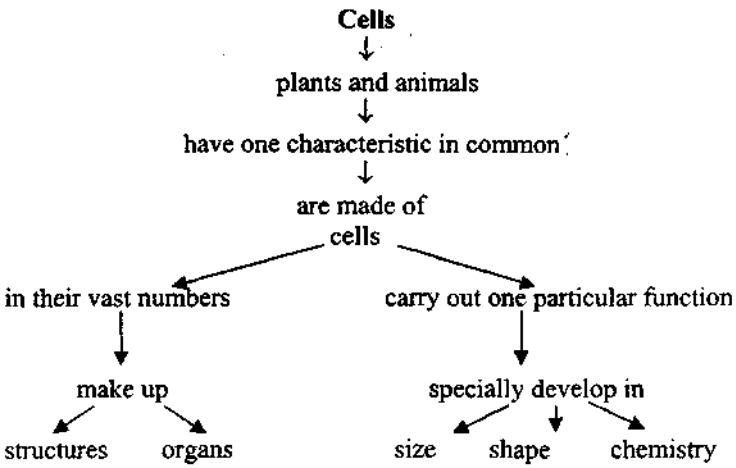
огромное количество; выполнять определенную функцию; состоять из; быть слишком маленьким; "типичная" клетка; иметь общую характерную черту.

V. Answer the following questions

1. What characteristic in common have all plants and animals?
2. What do cells make up?
3. Why are cells specially developed in their size, shape and chemistry?

VI. Sum up the text, use Model 1.

Model 1



Text 2

I. Read the text and say what information it carries.

Parts of the Cell

Cell walls[1](of plants) confer shape and, to some extent, rigidity[2] to the cell. While the cell is growing the cell wall is fairly plastic and extensible[3], but once the cell has reached full size, the wall becomes tough and resists[4] stretching[5].

The cell wall is freely permeable[6] to gases and water, i. e.[7] it allows them to diffuse through it in either direction.

The cell wall is made by the cytoplasm[8] and is non-living, being made of a transparent[9] substance called cellulose[10].

Middle lamella[11] is the name given to the first formed plate[12] of pectins between the cells. The cytoplasm of each cell forms a primary wall which is thickened by the deposition[13] of layers[14] cellulose.

Protoplasm[15] is the material which is truly alive. It is jelly-like and transparent, fluid[16] or semi-solid[17] and may contain particles[18] such as chloroplasts[19] or starch[20] grains[21]. In some cells it is able to flow about. In the protoplasm the chemical processes essential to life are carried on[22]. Unlike the cell wall its boundaries are selectively permeable, allowing some substances[23] to diffuse[24] through and preventing[25] others from doing so.

II. Remember the following words and word combinations:

1) cell wall - оболочка клетки;
2) rigidity [ri'd3iditi] - твердость, жесткость, негибкость неподвижность;
3) extensible [iks'tensə b l] – растяжимый;
4) resist [ri'zist] – сопротивляться;
5) stretching ['stret iŋ] – растяжение;
6) permeable ['pə:miəbl] – проницаемый;
7) i.e. - id est = that is - то есть;
8) cytoplasm ['saitouplæ zm] – цитоплазма;
9) transparent [træns'pɛərənt] - прозрачный, просвечивающий;
10) cellulose ['seljulous] - целлюлоза, клетчатка;
11) lamela [lə'melə] - (pl.-lae[-li:]) - пластинка, тонкий слой;
12) plate [pleit] - пластинка, чешуйка, бляшка;
13) deposition [,depə'ziʃn] - отложение, осадок;
14) layer [lɛə] - слой, пласт;
15) protoplasm ['proutəplæ zm] – протоплазма;
16) fluid ['ʃlu:id] – жидкость;
17) solid ['solid] - твердый, твердое вещество;
18) particle ['pa:tikl] – частица;
19) chloroplast ['klourəpl æ s t] – хлоропласт;
20) starch [sta:tʃ] – крахмал;
21) grain [grein] - крупинка, зерно;
22) carry on ['kæ ri'on] – вести;
23) substance ['sʌbstəns] – вещество;
24) diffuse [di' fju:z] - диффундировать, распылять, распространять;
25) prevent [pri'vent] - предохранять, препятствовать.

III. Suggest the Russian for:

confer shape and rigidity; the wall becomes tough; to be made up by the cytoplasm; a primary wall; to be truly alive; essential to life; selectively permeable.

IV. Suggest the English for:

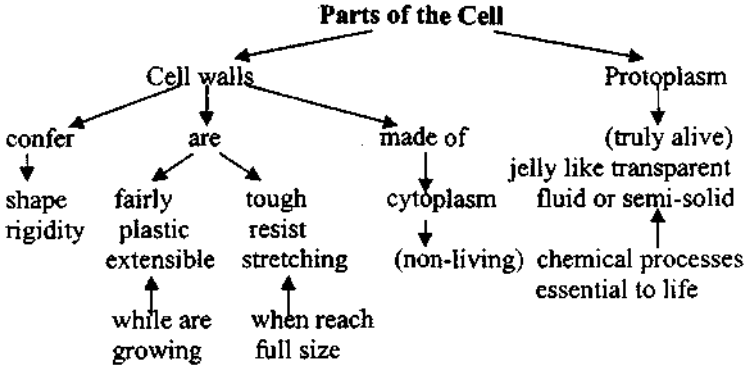
довольно пластичная и растяжимая; прозрачное вещество; сопротивляться растяжению; в любом направлении; отложение слоев; студенистый; в отличие от оболочки.

V. Answer the following question.

1. What do cell walls confer to the cell?
2. When is the cell plastic and extensible?
3. What is the cytoplasm made of?
4. What thickens the cytoplasm of each cell?
5. What kind of material is protoplasm?

VI. Sum up the text, use Model 2.

Model 2



Text 3

I. Read the text and state what it is about

The Chemical Elements of a Plant

The origin[1] of the substance of a plant and the development of the chemistry of gases could be fully explained only by the end of the last century.

In order to find out components of the threefold[2] medium[3] - earth, water and air - participate in the formation of a plant, we must know the composition of the plant itself. By no means all chemical elements are to be found in plants and even of those which occur[4], we shall mention only the principal ones, i. e. those which play a prominent part in the life of the plant. In order to get an idea of the composition of a plant, we submit it to the action of nigh temperature.

Water evaporates[5] first at a temperature a little above 100°C, and we obtain the so-called dry[6] matter of the plant. This is the first step in our analysis. It shows that different parts of a plant contain water in quite different proportions.

We notice that at a higher temperature the dry vegetable matter turns brown and black, and then becomes charred[7], until it begins to glow and burn with a flame leaving in the end a heap of ashes[8], very small in comparison with the initial quantity of the substance. Most of the substance must therefore have burned away and volatilized. If we carry out this combustion[9] with certain precaution and collect the volatile[10] gases, we discover that the part of the vegetable matter which burns away consists of four elements: solid carbon[11] and three gases-oxygen[12], hydrogen[13] and nitrogen[14]. This combustible part which contains carbon, as is shown by the fact that it chars before it burns, is called the organic substance of the plant. It is called organic because it enters into the composition of all organisms. At first people thought that organic matter could be formed only in living bodies, in organisms, and that only less complicated substances which make up dead or inorganic nature, could be produced artificially[15] in laboratories. But this opinion has been shaken by recent progress in organic chemistry.

Chemists now produce a great number of bodies the formation of which used to be considered a mystery of the living organism. All organic substances do not necessarily consist of all four elements; some of them are composed of three only - carbon, hydrogen and oxygen; or only of two - carbon and hydrogen. Moreover, these same elements are combined in different proportions in different substances, so that obviously in different plants, or in different parts of the same plant the elements will be present in different proportions. Nevertheless, by taking the means of a number of analyses of various plants and of their component parts, we can form an estimate[16] of the average[17] elementary composition of a plant. One hundred parts of dry vegetable matter contain on an average:

45.0 pet cent of carbon
6.5 per cent of hydrogen
1.5 pet cent of nitrogen
42.0 pet cent of oxygen
5.0 pet cent of ash

This table gives a clear idea of the rations in which the solid and gaseous elements must combine in order to produce a certain amount of vegetable matter. When, we pass from the study of the combustible organic part of a plant to the study of the ash, we find a great number of elements enter into the composition of the latter.

II. Remember the following words and word combinations:

1) origin ['orid3 in] - начало, происхождение;
2) threefold ['θri:fould] - тройной;

3) medium ['mi:diəm] (pl. media['mi:diə]) - среда ;
4) occur [ə'kə:] - встречаться, случаться;
5) evaporate [i'væ pəreit] - испарять(ся) ;
6) dry [drai] - сушить, сухой;
7) char [ta:] - обугливать(ся);
8) ash [æʃ] - зола;
9) combustion [kəm'bʌst ʃn] - сгорание, горение;
10) volatile ['vol∂tail] - летучий;
11) carbon ['ka:bən] - углерод;
12) oxygen ['oksid3ən]- кислород;
13) hydrogen ['haidrid3 ən] - водород;
14) nitrogen ['naitrid3ən] - азот;
15) artificial [,a:ti'fiʃl] - искусственный;
16) estimate ['estimit] - оценка;
17) average ['æ vərid3] – средний.

III. Suggest the Russian for:

the origin of the substance of a plant; in order to find out; by no means; to play a prominent part in ... ; dry matter of the plant; the combustible part of the vegetable matter;

IV. Suggest the English for:

участвовать в образовании растения; подвергнуть растение действию высокой температуры; становиться коричневым; по сравнению с; входить в состав; менее сложные вещества;

V. Answer the following questions

1. What components participate in the formation of a plant?
2. How can we prove that different parts of a plant contain water?
3. What does the combustible part of the vegetable matter consist of?
4. What is called the organic substance of the plant?
5. Why is the organic substance called so?

VI. Give the main points of the text information, make up a model of it.

VII. You are visiting a laboratory of a scientist who studies the chemical constituents of a plant. Ask him 10 questions on the subject.

Text 4

I. Read the text and say what information it carries

The Plant Cell

The cell is the unit of the plant structure.

A living cell contains protoplasm, the life substance of the plant organism. The denser[1] central area of the protoplasm is the nucleus[2], which is embedded[3] in the outer cytoplasm. The nucleus contains the chromosomes[4]. The cytoplasm contains chloroplasts, which in turn contain chlorophyll[5], the essential constituent of green plants. The plant cell is surrounded by a cell wall made up chiefly of cellulose, a structure which persists even when cell is dead.

Every plant has begun its development as a single[6] cell. When the cell divides, the nucleus also divides, one part going into each new cell. By the continued division, growth[7] and differentiation of a single initial cell, cells in vast numbers are produced and give rise[8] to the various tissues[9] and members of the adult[10] plant body. The cells which thus occur are said to constitute a tissue when a number of them have some common character, such as a structure (e. g. fibrous[11] tissue), function (e. g. conducting tissue, supporting tissue), or position (e. g. cortical tissue[12]). Though all cells possess individuality such that each equally respires[13] and deposits[14] its own cell wall and remains recognizably distinct from its neighbours, yet all the cells of the organism are interrelated and organized into the single unit of the organism. Cells differ in size and shape in accordance with their special functions.

All living cells give off[15] carbon dioxide[16] and absorb oxygen. This exchange[17] of gases, known as respiration, is accomplished by the breaking down of sugars and the oxidation[18] of the carbon dioxide. The most important aspect of respiration is the consequent release[19] of energy necessary for the growth and maintenance[20] of the plant.

II. Remember the following words and word combinations:

1) dense [dens] - густой, плотный;
2) nucleus ['nju:kliəs] (pl. nuclei ['nju:kliai]) - ядро;
3) embed [im'bed] - укреплять, вделывать;
4) chromosome ['krouməsoum] - хромосома;
5) chlorophyll ['klorəfil] - хлорофилл;
6) single ['siŋgl] - единственный, один, единичный;
7) growth [grouθ] - рост, развитие;
8) give rise (to) - быть причиной, давать начало;
9) tissue ['tisju:] - ткань;
10) adult ['ædʌt] - взрослый, зрелый;

11) fibrous ['faibrəs] - волокнистый;
12) cortical tissue ['kɔ:tikəl ' tisju:] - покровная ткань;
13) respire [ris'paiə] - дышать;
14) deposit [di' pozit] - осадок, отложение;
15) give off - испускать;
16) dioxide [dai'oksaid] - двуокись;
17) exchange [iks't∫eind3] - обмен;
18) oxidation [ˌoksi'dei∫ n] - окисление;
19) release [ri'li:s] - освобождать;
20) maintenance ['meintinəns] - поддержание;

III. Suggest the Russian for:

the essential constituent; vast numbers; a number of ...; the single unit of the organism; to be accomplished by ...; continued division.

IV. Suggest the English for:

в свою очередь; быть окруженным чем-либо; иметь общую черту; различаться по форме и размеру; в соответствии с.

V. Answer the following questions

1. What does protoplasm consist of?
2. What happens when a cell divides?
3. What gives rise to various tissues of the adult plant body?
4. When do cells constitute a tissue?
5. What exchange of gases takes place in living cells?
6. What is the most important aspect of respiration?

Text 5

I. Read the text to discuss the importance of the nucleus of a living cell

The nucleus is made of a special kind of protoplasm. It is always embedded in the protoplasm, is frequently ovoid[1] in shape, and is lighter in colour than the surrounding protoplasm.

The nucleus is thought to be a centre of chemical activity; it probably plays an important part in determining[2] the shape, size and function of the cell, controling most of the physiological processes within it. Without the nucleus the cell is not capable of its normal functions or of division, although it may continue to live for a time. Protoplasm other than that of the nucleus is called cytoplasm.

Notes

1) ovoid ['ouvoid] - яйцевидный;
2) determine [di'tə:min] – определять.

Text 6

I. Read the text and state what it is about

Respiration

Respiration in living organisms is the series of chemical changes that release energy from food material. It involves a complicated chain[1] of chemical break-downs[2] accelerated by enzymes[3].

Aerobic respiration is the respiration which uses oxygen. Sometimes this process is called tissue respiration, or internal respiration. The energy released by respiration is used for such activities as muscular contraction, nervous conduction[4] and secretion[5] of enzymes, and it can be regarded as one of the most important aspects of the vital[6] chemistry of living matter.

Anaerobic respiration is the release of energy from food material by a process of chemical break-down which does not require oxygen. The end-products are frequently alcohol[7] and carbon dioxide, and the energy released is less than if the same weight of food were completely oxidized as in aerobic respiration.

II. Remember the following words and word combinations:

1) chain [tʃ ein] - цепь;
2) break-down - рпсщепление, деление, распад;
3) enzyme ['enzaim] - энизм, фермент;
4) nervous conduction ['nə:vəskən'dʌkʃn] - нервная проводимость;
5) secretion [si'kri:ʃ n] - выделение, секреция;
6) vital ['vaitl] - жизненный;
7) alcohol ['ælk ∂hol] – спирт.

III. Suggest the Russian for:

muscular contraction; to be regarded as ...; to be completely oxidized; aerobic respiration; tissue respiration; vital chemistry.

IV. Suggest the English for:

конечные продукты; тот же вес пищи; освобождать энергию; такая деятельность как ...; вовлекать сложную цепь химических реакций.

V. Make up indirect questions and ask another student to answer them. Begin your questions with: I wonder ... I want to know ... I'd like to know ...

1. What is respiration in living organisms?
2. What does respiration involve?

3. What is the energy released by respiration used for?
4. What kind of respiration is called anaerobic respiration?
5. What are the end-products of anaerobic respiration?

Text 7

I. Read the text and pick out the basic idea of the text

Photosynthesis[1]

Photosynthesis, which occurs in all land plants and many water plants, is a food-manufacturing process upon which all living thinge depend. The word is made up of two terms-photo, meaning light and synthesis, in chemistry meaning the combination of two or more simple elements into a complex chemical compound. More precisely[2], photosynthesis is the process by which plants use the energy of light to produce compounds, such as sugar and starch, from a number of substances including water and carbon dioxide. In addition to the organic compounds, photosynthesis forms oxygen which is released into the air. In the conversion of light energy into chemical energy, photosynthesis is a primary energy-producing process for all plant and animal life.

Notes

1) photosynthesis ['fouθ'sinθesis] - фотосинтез;
2) precisely [pri'saisli] – точно.

II. Make up 3 questions covering the main points of the text.

Text 8

I. Read the text and pick out the principle idea of each paragraph

Green Plants Capture[1] the Energy of Sunlight.

Living things grow, move and reproduce. Each of these activities requires energy and so plants and animals must have food to supply the energy they need. The secret of the world's food production is found inside the green leaves of plants. For in this laboratory of nature, water from the soil and carbon dioxide from the air are chemically united. In this process the energy of sunlight is captured.

This unique ability[2] of green plants to capture the radiant energy from sunlight and with it convert plain water and dioxide into food may be the most important ability in our world. Animals do not have this ability. Therefore, it follows that[3] without green plants neither people nor any other animal live

could live on this earth. We are all dependent upon green plants for our very lives.

Notes

1) capture ['kæ pt ʃə] - захватывать, добывать;
2) ability [ə'biliti] - способность;
3) it follows that - (зд.) отсюда следует, что...

III. Make an outline of the text.

Text 9

I. Read the text and state what information carries

Transpiration[1]

Transpiration is the process by which plants lose water as water vapour[2] into the atmosphere. Most of this loss takes place through the leaves[3] but evaporation[4] also occurs from the stem[5] and flowers.

For adequate photosynthesis to take place, a large surface area must be exposed to the atmosphere to absorb[6] sunlight and carbon dioxide. A leaf which is permeable[7] to carbon dioxide will also be permeable to water vapour. It therefore seems that transpiration must inevitably accompany photosynthesis.

How transpiration takes place.

Some of the water in the cells of a leaf passes through the cell walls and evaporates into the intercellular spaces. From here it diffuses out into the atmosphere through the pores[8] in the epidermis[9] of the leaf. These pores are called stomata and the greater part of the water vapour passes out through them.

II. Remember the following words and word combinations:

1) transpiration [ˌtrænspə'rei ʃn] - транспирация, испарение;
2) vapour ['veipə] - пар;
3) leaf [li:f] (pl. leaves [li:vz]) - лист;
4) evaporation [i,væpə'reiʃn] - испарение;
5) stem [stem] - стебель;
6) absorb [ə'b'so:b] - поглощать;
7) permeable ['pɜ :miəbl] - проницаемый;
8) pore [po:] - пора;
9) epidermis [ˌepi'dɜ :mis] – эпидермис.

III. Answer the following questions.

1. In what way do plants lose water?
2. What is necessary for photosynthesis?
3. In what stages does transpiration take place?

Text 10

I. Read the text and say what information it carries

Taxonomy[1]

The plant world is made up of about 300000 different kinds of plants; each kind is known as a species[2], and really is a group of plants so closely related that they do not differ much from each other in any important way. Such a plant species is the Red Oak[3] or the White Pine[4]. Two or more species are grouped by biologists into a genus[5] if the species have more characteristics in common with each other than with any other kind of the plant. Thus the Red Oak and the White Pine are two species of the oak genus, all pines are in the same genus, as are all roses. In speaking of a plant scientifically, we mention both the genus and the species, naming the former first. Thus the Scotch Pine is known as Pinus (the genus name) Silvestris (the species name).

Just as species which are like each other are grouped into genera, so are genera which have characters in common grouped into a family: the Rose family includes such genera as Roses, Apples, Hawthorns and Strawberries. Related families are grouped into larger divisions of the plant kingdom, such as orders[6] and classes and phyla[7]. The phylum is the largest group of related plant species; the whole plant kingdom is subdivided into phyla.

II. Remember the following words and word combinations:

1) taxonomy [tæk'sonəmi] - систематика, таксономия;
2) species ['spi:ʃ i:z] (pl. без измен.) - вид;
3) oak [ouk] - дуб;
4) pine [pain] - сосна;
5) genus ['d3i:nəs] - (pl. genera ['d3énərə]) - род;
6) order ['o:də] - отряд, подкласс;
7) phylum ['failəm] (pl. phyla ['failə]) - тип

III. Suggest the Russian for:

to be closely related; both ... and; to have some characteristics in common; to be subdivided into; to be in the same order.

IV. Suggest the English for:

быть похожим друг на друга; группироваться в ...; состоять из ...; родственные виды; первый (из названных).

V. Define the following terms

1. Species.
2. Genus.
3. Family.
4. Phylum.

VI. Ask another student about the scientific division of the plant kingdom.

Text 11

I. Read the text and say what it is about

Flowering Plants

A typical flowering plant consists of two parts - the root system[1] and the shoot system[2].

The main functions of the root system are to anchor the plant in the ground and to absorb water and mineral salts; the main functions of the shoot system are to manufacture food[3] and to produce[4] flowers and seeds. In order to examine the root system pull up some plant carefully and wash the roots. You will see that it has a main root which grows straight downwards into the soil, branching from it numerous lateral[5] roots. This whole mass of roots is called the root system.

In some plants the main root may serve to store food. In other plants such as the grasses there is no clearly defined main root but a number of roots of the same size. Such a system is called fibrous.

The shoot system consists of a branched stem bearing leaves, buds[6] and perhaps flowers and fruits.

The stem is erect, cylindrical and strong. The lower part is woody while the upper part is green, more tender and hairy. For some distance above ground lever there are no leaves but tiny leaf scars left when the leaves withered and fell off. The leaves are arranged spirally round the stem; the part of the stem to which the leaf is attached is called a node[7] and the part between two leaves is an internode[8].

At the tip of the stem[9], if there are no flowers, the leaves are small, very close together and form a bud.

The main functions of the stem are to support the leaves and flowers and to carry materials from the roots to the leaves and vice versa[10]. In some plants stems are also used to store food.

The main functions of the leaf are to manufacture food for the plant and to permit the exchange of gases between the plant and the air.

II. Remember the following words and word combinations:

1) the root system ['ru:t' s istəm] - корневая система;
2) the shoot system [ʃ u:t] - надземная система;
3) manufacture food [ˌmænju'fæktʃə] - производить пищу;
4) produce [prə'dju:s] – производить;
5) lateral ['lætərəl] – боковой;
6) bud [bʌd] - почка, бутон;
7) node [noud] – узел;
8) internode [intə'noud] – междоузлие;
9) at the tip of the stem - на кончике стебля;
10) vice versa ['vaisi'və:sə] – наоборот.

III. Suggest the Russian for:

in order to do something; a number of roots; the lower part of the stem; above ground level; to permit the exchange of gases.

IV. Suggest the English for:

служить для хранения (накапливаться) пищи; разветвленный стебель; быть расположенными близко друг к другу; закрепить растение в земле; верхняя часть стебля.

V. Answer the following questions

1. What are the main functions of the root system?
2. What are the main functions of the shoot system?
3. What does the root system consist of?
4. What root system is called fibrous?
5. What does the stem look like?
6. What are the main functions of the stem?

Text 12

I. Read the text and state what it is about.

Breathing[1] Plants

If you were to ask a chemist what he considered the most important chemical process in the world, he would not hesitate to answer, "The making of starch by plants."

A green plant is nature`s chemical laboratory. It is able to take carbon dioxide from the air and water from the soil and build them into starch and sugar; the process is made possible by the action of sunligth on the green colouring material of the plant.

If you have a growing plant in your home, preferably ivy[2] or some vine-like plant[3], try this experiment: fill a test tube[4] to the very top with water and using your thumb[5] as a stopper, turn the tube upside down[6] in a bowl of water. Now, begin very careful to keep the mouth of the tube[7] under water, take your thumb away and push a branch[8] of the plant up inside the tube, then set the whole arrangement in the sun.

In a few hours you will find what seems to be a vacant space at the top of the tube. This space is really filled with oxygen which was produced by sunlight acting on the leaves of the plant.

II. Remember the following words and word combinations:

1) breathe [bri:ð] – дышать;
2) ivy ['a:vi] – плющ;
3) vine-like ['vain 'laik 'pla:nt] - ползучее растение (типа дикого винограда);
4) a test tube – пробирка;
5) thumb [θʌm] - большой палец;
6) upside down ['ʌpsaid'daun] - вверх дном;
7) the mouth of the tube ['mauθ... ... 'tju:b] - отверстие пробирки;
8) branch [bra:ntʃ] - ветвь, ветка.

III. You are visiting a laboratory of a scientist who carries out the experiment mentioned above. Ask him 10 questions on the procedure and the results of the experiment.

Text 13

I. Read the text and state what it is about.

The Seed[1]

A mature[2] seed consists of the seed coat[3] (testa) nucleus, endosperm[4] and embryo[5]. The embryo or germ[6] is composed of the plumule[7], hypocotyl[8](stem), radicle[9](root), and one or two cotyledons[10](primary leaves). The most important constituents of the endosperm, or food supply, in the seed are starch, fats[11], proteins[12] and minerals. The seed may be defined as a matured ovule[13]. The bean[14] is a good example of a seed. It is attached to the ovary[15] wall (pod)[16] by a short stalk[17] termed the funicle[18]. The elongated scar[19] on the bean, where the funicle was attached is called the hilum[20]. Close to one end of the hilum is a small opening called the micropyle[21]. A seed coat or testa covers the bean, beneath which are two fleshy halves called cotyledons. A typical endosperm is lacking in the bean, the cotyledons occupying most of the space within the seed coat.

When the seeds of a plant have undergone their proper period of rest and have been brought either by nature or by man into favourable conditions they begin to sprout[22] or germinate[23]. The three essential factors for the sprouting of seeds are warmth, moisture[24], and oxygen of the air. When the seed sprouts, the hypocotyl and radicle of the embryo elongate, one growing upward and the other downward.

Seeds are extremely variable in size, shape and colour, but they can be easily grouped into two main classes, monocotyledons[25] and dicotyledons[26], depending on whether the embryo possesses one or two cotyledons or primary leaves. These two classes include all the true flowering plants, and are frequently referred to as monocots (e.g. the corn) and dicots (e.g. the bean), or mono- and dicotyledonous plants.

A fruit is a matured ovary. It contains the seeds or matured ovules. The mature ovary wall is known as the pericarp[27]. The entire bean pod is a fruit but the beans are seeds. The buckwheat[28] fruit and the grass fruit are commonly called seeds.

II. Remember the following words and word combinations:

1) seed [si:d] –семя;
2) mature [mə'tjuə] - зрелый, созревший;
3) seed coat - кожура (оболочка) семени;
4) endosperm ['endəspɜ :m] –эндосперма;
5) embryo ['embriou] – эмбрион;
6) germ [dʒɜ: m] – зародыш;
7) plumule ['plu:mju:l] - почечка (первичная листовая почка);

8) hypocotyl - гипокотиль, подсемядольное колено;
9) radicle ['rædikl] - первичный корешок, зародышевый корень;
10) cotyledon [ˌkoti'li:dn] – семядоля;
11) fat [fæt] - жир;
12) protein ['prouti:n] - протеин, белок;
13) ovule ['ouvju:l] - семяпочкаб яйцеклетка;
14) bean [bi:n] - боб;
15) ovary ['ouvəri] - завязь;
16) pod [pod] - стручок;
17) stalk [sto:k] - стебель, черенок;
18) funicle ['fju:nikl] - семяножка;
19) scar [ska:] - рубец, рубчик;
20) hilum ['hailəm] - рубчик семяни;
21) micropyle ['maikrəpail] - пыльцевход, семявыход;
22) sprout [spraut] - пускать ростки; прорастать;
23) germinate ['dʒɜ: mineit] - прорастать;
24) moisture ['moist ʃə] - влажностьб влага;
25) monocotyledon ['monoukoti'li:dən] - однодольное растение;
26) dicotyledon [daikoti'li:dən] - двудольное растение;
27) pericarp ['perika:p] - околоплодник; перикарпий;
28) buckwheat ['bʌkwi:t] – гречиха.

III. Answer the following questions:

1. What is the embryo composed of?
2. What does the endosperm consist of?
3. What is the structure of the bean?
4. When do the seeds begin to sprout?
5. What are the essential factors for germinating of seeds?
6. What is the principle of class division of seeds?

Text 14

I. Read the text and say what it is about.

The Life of the Plant. Seed and Germination

On examining germinating seeds, such as beans, more closely we notice that while the rood and the stem with its young leaves increase in size, the first pair of leaves, the cotyledons, become wrinkled[1], are gradually absorbed, and diminish in size. This observation may serve as an indication of the fact that the development of some parts of a shoot[2] takes place at the expense of[3] others. Other seeds, such as grasses, present a somewhat more complicated structure

than the seeds of beans. If we split[4] a grain of wheat[5] longitudinally, we find under the seed-coat two perfectly distinct parts: the whole grain and the separate parts. There is also a small body which is simply a seedling[6], an embryonic[7] plant, such as can easily be seen in any germinating seed. We notice in it a leaf-bud[8] and the beginning of the root. The remaining larger proportion is filled with a white uniform, mealy[9] mass, called the endosperm.

The nature as well as the position of the endosperm may differ in various seeds. In grasses, for instance, it is such endosperm which forms the essential part of flour, the embryo being comparatively small.

The period of germination is unique because of the fact that during its course the plant does not require any external supply[10] of food; it subsists on the food stored up[11] in the endosperm or in the cotyledons. Three factors are indispensable to arouse the seed to activity: these are water, the oxygen of the air and heat. Water is needed - for a seed does not germinate in dry soil[12], heat is needed - for a seed sown[13] during a cold spring does not show any sign of development until the sun warms it, lastly, air is needed - for a seed buried deeply in the soil may remain very long without germinating. Thus water, head and air are the essential conditions which awaken the seed to life.

II. Remember the following words and word combinations:

1) wrinkle ['rïŋkl] - морщить(ся) ;
2) shoot [ʃ u:t] - росток, побег;
3) at the expense of ... [iks'pens] - за счет;
4) split [split] - расщеплять, раскалывать, разбивать;
5) wheat [wi:t] - пшеница;
6) seedling ['si:dliŋ] - сеянец, рассада;
7) embryonic [ˌembri'onik] - эмбрионный;
8) leaf-bud - листовая почка;
9) mealy ['mi:li] - мучнистый;
10) supply [sə'plai] - снабжение, поставка;
11) store up [sto:r'Ʌp] - накапливать;
12) soil [soil] - почва;
13) sow [sou] (sowed [soud]; sown [soun]) – сеять.

III. Suggest the Russian for:

perfectly distinct parts; to examine more closely; to arouse something to activity; to remain without germinating; essential conditions.

IV. Suggest the English for:

также как и; проявлять признаки развития; быть необходимым; оставшаяся часть; пробудить к жизни; расщепить вдоль.

V. Supply extended answers.

1. Why do the cotyledons become wrinkled when the other parts of the plant increase in size?
2. What is the structure of a grain of wheat?
3. What kind of endosperm do grasses possess?
4. Why is the period of germination unique?
5. What factors are essential to arouse the seed to activity?

VI. Give a short account of the process of germination

Text 15

I. Read the text and state what it is about

The Root[1]

By the term root those parts of the plant body are meant which usually develop below ground. When the seed sprouts, the root is the first organ of the embryo to break through the seed-coat. It grows downward, away from the light, into the soil which contains the food materials and water. Roots serve many purposes in the life of plants, but their duties vary in different plants. The most important functions are as follows: anchorage[2], gathering of water and food materials, storage[3] of water and food.

Some plants (cereals[4], grasses) have fibrous roots[5] and in large plants they are very woody[6] and hard, while the roots of other plants are thick and fleshy (e.g. root crops[7]). The fibrous roots branch irregularly and serve for anchorage and also for the entrance of water and dissolved[8] food materials. The fleshy roots (taproots[9]) in addition to this, also serve as places for storage of large quantities of foods.

Certain weeds[10] have lateral roots that send up new shoots which in turn establish new root systems.

Frequently roots grow form nodes above the soil surface as, for example, the brace roots[11] of corn[12]. Aerial roots[13] may serve for climbing on trees and buildings, stone walls and other solid objects.

Roots are made up of three parts: central cylinder composed mainly of woody tissue; this is surrounded by a cortex[14] and covered with a very thin epidermis. They grow in length much more rapidly than in thickness and the very delicate tip[15] is protected by a mass of cells known as the root cap[16]. The smallest subdivisions of the roots are the root hairs[17]. Each root hair is a thin-walled cell containing living protoplasm and cell sap[18]. The living protoplasm has the power of absorbing water and the substances dissolved in it. The root hairs absorb water by osmosis[19].

The root hairs persist for a very short time and then perish, but new ones are produced near the growing tips. The number of root hairs varies with the amount of water in the soil. They are more numerous on dry than in wet soil.

II. Remember the following words and word combinations:

1) root [ru:t] - корень;
2) anchorage ['æŋkərid3] - укрепление;
3) storage ['sto:rid3] - хранение, накопление;
4) cereal ['siəriəl] - зерновой, хлебный злак;
5) fibrous ['faibrəs] root - мочковатый корень;
6) woody ['wudi] - деревянный;
7) crop [krop] - культура;
8) dissolve [di'zolv] - растворять(ся) ;
9) taproot ['tæpru:t] - стержневой корень;
10) weed [wi:d] - сорняк, сорная трава;
11) brace [breis] root - опорный корень;
12) corn [ko:n] - зерно; (амер.) - кукуруза;
13) aerial ['ɛəriəl] root - воздушный корень;
14) cortex ['ko:teks] - кора;
15) tip [tip] - кончик;
16) root cap - корневой чехлик;
17) root hair - корневой волосок;
18) sap [sæp] - сок;
19) osmosis [oz'mousis] – осмос.

III. Make up indirect questions and ask another student to answer them. Begin your questions with:

I'm interested to know ...
It's interesting to know ...
It is of interest to know ...

1. What does the term root mean?
2. What is characteristic for fibrous roots?
3. What are the functions of taproots?
4. What do aerial roots serve for?
5. In what way do roots absorb water?
6. What does the number of the root hairs depend on?

IV. Discuss the following points.

1. The functions of the root.
2. The variety of roots existing in nature.
3. The structure of root hairs.

Text 16

I. Read the text and say what information it carries

The Stem

1. The stem is that part of the plant which connects the root with the leaves. The primary functions of stems are to support the foliage[1] and flowers and pass the water and food substances from one part of the plant to another. But stems also serve many other purposes (e.g. accumulation[2] water and food substances for future use, reproduction[3], etc[4].)

2. The stem usually shows well-defined divisions into nodes (joints[5]) and internodes[6] as indicated by branches, leaves and leaf scars, buds and bud scars.

3. The monocotyledonous[7] and dicotyledonous[8] plants have different stems. In both cases the stems consist primarily of fibrous bundles[9] but arrangement[10] is quite different. The stem or stalk of corn is a good example of the monocotyledonous stem. The fibrous bundles are embedded in a soft pithy[11] structure and surrounded by a hard rind[12] like covering which is of the same nature as the fibrous bundles. In most of the grasses and grains which are also monocotyledonous plants, the stems are hollow[13] and therefore, the bundles are in a more or less definite ring[14]. Most of the growth of the monocotyledonous stems occurs near the tips.

4. The structure of the dicotyledonous stem can be illustrated by the stems of most of our trees and many of out shrubs[15]. The bundles appear more or less wedge-shaped[16] in cross-sections[17], are arranged in a circle and are separated by thin layers of tissue known as the medullary[18] rays[19]. The pith in the centre, the medullary rays and the annual rings which indicate the age of the plant are usually seen in the cross-section of a stem. Each bundle is divided into an inner (xylem) and outer (phloem) part by the cambium[20], which is a thin layer of growing tissue. The cambium forms a continuous zone or delicate sheath[21] below the bark[22] and appears as a very delicate circle in cross-section. The cambium is the growing past of the plant and accounts for[23] the increase in diameter of the stem.

5. Stems in which the fibrous bundles are small as compared with the surrounding materials are soft and juicy[24], and are called herbaceous[25] while those in which the fibrous bundles constitute the greater part of the substance are called woody.

6. The most common types of stems of seed-bearing plants are above ground, but many plants have underground stems that are frequently mistaken for roots. However, they can be readily recognized by the fact that, like all stems, they are divided into more or less regular nodes and internodes and the branching is always from these nodes and is therefore regular, while the roots are without nodes and branch irregularly.

II. Remember the following words and word combinations:

1) foliage ['foulid3] – листва;
2) accumulation [ə'kju:mju'lei.ʃn] – накопление;
3) reproduction[,ri:prə'dʌkʃn] - воспроизведение, размножение;
4) ets. - et cetera = and so on;
5) joint [d3oint] – сустав;
6) internode ['intə,noud] –междоузлие;
7) monotyledonous ['monoukoti'li:dənəs] -односемядольный, однодольный;
8) dicotyledonous [daikoti'li:dənəs] - двудольный, двусеменодольный;
9) bundle ['bʌndl] – пучок;
10) arrangement [ə'reind3mənt] - устройство, расположение;
11) pith [piθ] – сердцевина;
12) rind [raind] - кора, корка;
13) hollow ['holou] - полый, пустой;
14) ring [riŋ] - кольцо, годичное кольцо дерева;
15) shrub [ʃ rʌb] - куст, кустарник;
16) wedge-shaped [wed3 ʃ eipt] – клиновидный;
17) cross-section ['kros'sek ʃn] -поперечное сечение;
18) medullary [me'dʌlərі] – сердцевидный;
19) ray [rei] – луч;
20) cambium ['kæmb iəm] – камбий;
21) sheath [ʃi:ə] – оболочка;
22) bark [ba:k] – кора;
23) to account for [ə'kaunt] - объяснять, отвечать (за что-либо);
24) juice[d3 u:s] – сок;
25) herbaceous [hз: ' beiʃəs] - травянистый, травяной.

III. Answer the following questions

1. What indicates the division of the stem into nodes and internodes?
2. What kind of plants are most grasses and grains?
3. What type do trees and shrubs belong to?
4. What does cambium account for?
5. How can stems of seed-bearing plants be distinguished from roots?

IV. Speak on the following points

1. The structure of the monocotyledonous stem.
2. The structure of the dicotyledonous stem.
3. The functions of the stem.

Text 17

I. Read the text and state what it is about

The Leaf

1. Leaves arise from buds and are side or lateral appendages[1] of the plant stem.

2. The primary function of leaves is to serve as foliage through which the living, growing plant receives gases from the air and energy from the sun and in which the raw food substances are transformed into true foods. This process is known as photosynthesis. But the leaves serve many other useful purposes which are important in the life of the plant. They are the organs of transpiration[2] and respiration[3]. The leaves may also serve as a protection[4] against birds and animals. Sometimes they serve for the storage of food and water.

3. The principal parts of a leaf are the blade[5] or lamina[6] and the petiole[7] or leaf stalk. Some leaves have stipules[8], which are two small leaves at the base of the petiole. The leaf is said to be sessile[9] when the petiole is absent.

4. Ordinary green foliage leaves may be classified as parallelveined10 leaves and net-veined[11] leaves. The parallel-veined leaves have a number of equally prominent veins running from fan[12] to tip. The net-veined leaves have one prominent midrib[13] running from base to apex[14] and giving rise to numerous side branches with smaller veinations between them. Leaves with a single midrib from which smaller ribs are derived are pinnate[15]-net-veined or feather[16]-net-veined. Those having three, five or more prominent ribs from a common point at the base and giving rise to numerous branches are palmate[17]-net-veined or radiate-net-veined. Leaves which are composed of two or more leaflets[18] arising from a single petiole are said to be compound leaves (pinnate-or feather-compound and palmate-or radiate-compound).

II. Remember the following words and word combinations:

1) appendage [ə'pendid3] – придаток;
2) transpiration [,trænspi'rei ʃn] – испарение;
3) respiration [,respə'rei ʃn] – дыхание;
4) protection [prə'tek ʃn] - защита, предохранение;
5) blade [bleid] - листовая пластинка, лист;
6) lamina ['læminə] (pl. laminae ['læmini:]) - листовая пластинка;
7) petiole ['petioul] - листовой черешок;
8) stipule ['stipjul] – прилистик;
9) sessile ['sesil] - сидячий, бесчерешковый;
10) vein [vein] - жилка (листа);
11) net-veined ['netveind] – сетчатонервный;
12) fan [fæn] – веер;

13) midrib ['midrib] - средняя жилка листа;
14) apex ['eipeks] (pl. apices ['eipisi:z]) - верхушка, вершина;
15) pinnate ['pinit] – перистый;
16) feather ['feðð] - перо (птицы);
17) palmate ['pælmit] -- пальчатый;
18) leaflet ['li:fl it] - листочек, листок.

III. Suggest the Russian for:

raw food substance; the base of the petiole; primary function; a number of prominent veins; a common point at the base.

IV. Suggest the English for:

превращаться во что-либо; возникать из чего-либо; служить для многих целей; главная часть листа; давать начало чему-либо.

V. Let your groupmate answer your questions on:

1. The functions of the leaves;
2. The main parts of a leaf;
3. The principles of classifying leaves;

Begin your questions with: I wonder ...
I want to know ...
I'd like to know ...

Text 18

I. Read the text and state what it is about

The Flower

The flower does not present any new structure, but is a shortened stem bearing circles of leaves, which have been greatly modified in shape and colour into parts constituting the flower. Instead of being on a long stem, they are now brought together in circles and the shortened stem is known as the receptacle[1] or torsus[2]; the first or outer circle, composed of parts which are usually green and which resemble ordinary leaves, is known as the calyx[3], and each leaf like part is called a sepal[4], the second circle or series of circles, composed of parts which also have some resemblance to leaves but which are usually coloured, is known as the corolla[5], and each part of it is called a petal[6], the third set of organs consisting of one or more circles is composed of stamens[7] which bear very little resemblance to leaves; the last or central group consisting of one or more organs which may be distinct or united is the pistil[8], which also bears very little resemblance to leaves. The calyx and corolla constitute the floral envelope or

perianth[9], while the stamens and pistils are the sexual[10] or essential organs of the plant and are necessary for reproduction.

2. In some flowers the parts of these outer circles are practically alike in both shape and colour, while in other flowers there is no corolla. When the corolla is missing, the calyx may be green, but it is usually of some other colour which deceives many observers into believing it to be the corolla. The anemone[11] is a good example of a flower with coloured calyx and no corolla.

3. When the corolla alone is absent, the flower is described as apetalous[12]. Some plants have flowers with neither calyx nor corolla, but these incomplete flowers are just as important in the life history of the plant as the very complicated and highly coloured flowers of other species.

4. A flower which is composed of the four sets of organs is said to be complete, and a flower possessing both stamens and pistils, regardless of the presence or absence of calyx and corolla, is said to be perfect. A flower in which the number of organs in each set is the same or a multiple of the same is symmetrical. If all of the organs of each set are of the same size and shape it is regular. The opposites of them are incomplete, imperfect, unsymmetrical and irregular. The flowers of the apple, peach[13] and cherry[14] are complete and perfect; the lily[15] is symmetrical and regular; the flower of the corn is incomplete and imperfect; that of the apple and peach-unsymmetrical, the violet[16] and bean-irregular.

II. Remember the following words:

1) receptacle [ri'septəkl] – цветоложе;
2) torsus ['to:səs] – цветоложе;
3) calyx ['keiliks] – чашечка;
4) sepal ['si:pəl] – чашелистик;
5) corolla [kə'rolə] – венчик;
6) petal ['petl] – лепесток;
7) stamen ['steimən] – тычинка;
8) pistil ['pistil] – пестик;
9) perianth ['periænθ] – околоцветник;
10) sexual ['seksjuəl] – половой;
11) anemone [ə'neməni] – ветреница;
12) apetalous [ə'petələs] – безлепестной;
13) peach [pi:tʃ] – персик;
14) cherry ['tʃeri] – вишня;
15) lily ['lili] – лилия;
16) violet ['vaiəlit] – фиалка.

III. Suggest the Russian for:

neither calyx nor corolla; to bear resemblance to ...; the very complicated flowers; to present something; essential organs.

IV. Suggest the English for:

как форма, так и цвет; независимо от ...; состоять из ...; быть похожими (одинаковыми); быть сильно измененным по форме.

V. Supply extended answers.

1. What is the flower?
2. What is the structure of the flower?
3. Why do many observers believe the calyx to be the corolla?
4. Into what groups are flowers classified according to their structure?
5. What are the characteristic features of each group?

Text 19

I. Read the text and say what information it carries?

Studying the Main Parts of a Flower

Examine specimens[1] of large simple flowers such as tulips[2] or lilies. Count the stamens and observe how they are arranged about the central pistil. Label[3] the parts of the pistil (stigma[4], style[5] and ovary). Label the parts of the stamen (filament[6] and anther[7]). The end of the stalk on which the flower grows is called the receptacle. At the base of the receptacle there are usually leaf-like structures that enclose the bud. These are called sepals. Above the sepals there is usually a ring of brightly coloured petals called the corolla.

Label each of fine cards or pieces of paper with one of the following words: stamens, pistil, petals, sepals, receptacle. Dissect a flower carefully and place the parts neatly on the appropriate cards. Simple flowers with a single row of petals should be selected.

Pick up one of the stamens and rub the anther lightly across a piece of black paper. Traces[8] of pollen[9] will usually be seen.

Cut the ovary crosswise with a sharp knife and count the ovules, or "seed pockets". Look for traces of seeds in the ovules.

Examine the young stems with a hand lens. Can you see that they are covered with tiny hairs? Now compare the upper and lower surfaces of the leaves. Which is the more hairy? You will notice that each leaf is joined to the stem by a short leaf-stalk and that the latter continues up the middle of the leaf-blade as a strengthening ridge[10] or midrib. If you hold the leaf near the lamp you will see veins branching from the midrib and forming a network.

What do these parts of the shoot system do? The leaves are the parts where complex foods are made from carbon dioxide of the air, sunlight and water. This process is called photosynthesis Carbon dioxide and sunlight are absorbed by the leaves, but water is taken up by the roots and carried up through the stem to these organs. The stem also serves to hold the leaves erect so that they can absorb the sunlight.

Some of the upper lateral branches may have flowers near their tips instead of leaves. The flowers are the reproductive parts[11] of the plant, and from them develop the fruits which contain seeds. In most flowers are four sets of parts all attached to the swollen tip[12] of a stem.

II. Remember the following words and word combinations:

1) specimen ['spesimin] - образец, экземпляр;
2) tulip ['tju:lip] – тюльпан;
3) label ['leibl] - наклеивать ярлык; ярлык, бирка;
4) stigma ['stigmə] – рыльце;
5) style [stail] - стель, столбик цветка;
6) filament ['filəmənt] – нить;
7) anther ['ænθə] – пыльник;
8) trace [treis] – след;
9) pollen ['polin] – пыльца;
10) ridge [rid3] – гребень;
11) reproductive parts [ˌri:prə'dʌktiv] - органы размножения;
12) swollen ['swoulən] tip - расширенный конец.

III. You are visiting a laboratory of a scientist who is going to show you the structure of a flower. Ask him 10 questions on the procedure of the experiment.

IV. Tell your friend what you saw in the laboratory. Give a detailed description of the experiment.

Text 20

I. Read the text and state what it is about

Pollination

The transfer[1] of pollen from anthers to stigma is called pollination. Cross-pollination is the transfer of pollen from the anthers of one flower to the stigma of another flower of the same species. In some species self-pollination occurs either regularly or when cross-pollination has failed to take place, as in the willow herb[2]. In cross-pollination pollen is usually transfered on the bodies of

insects[3] which enter the flowers, or by air-currents carrying the pollen from one flower to the next. The structures of many flowers are closely adapted to the method of insect or wind pollination.

With wind pollination, only a very small proportion of pollen grains is likely to land on a ripe[4] stigma. Smooth, light grains are readily carried in air current and do not stick[5] together. In pollination by insects, fewer of the pollen grains will be wasted[6].

II. Remember the following words:

1) transfer ['†rænsfə] – перенос;
   to transfer [†ræns'fə:] – переносить;
2) willow herb ['wilou hə:b] - иван-чай;
3) insect ['insekt] – насекомое;
4) ripe [raip] - спелый; зрелый;
5) stick [stik] (stuck [stʌk]) - приклеивать(ся) липнуть;
6) waste [weist] – терять.

III. Answer the following questions.

1. What process is called pollination?
2. What is cross-pollination?
3. When does self-pollination occur?
4. What are the structures of many flowers adapted to?
5. Which method of pollination is more effective and why?

IV. Give a short account of the process known as pollination.

Text 21

I. Read the text and entitle it

After fertilization[1] the ovary of a plant develope into a fruit. Fruit formation depends on fertilization, which can follow only after pollination.

Farmers and fruit growers know that a good yeild[2] of fruit will occur only if most of the available flowers have been pollinated. Many of the cereals are self-pollinated or wind-pollinated. Insect pollination needs a very dense population of insects, particularly bees[3].

II. Remember the following words:

1) fertilization [ˌfə:†ilai'zeiˑn] – оплодотворение;
2) yield [ji:ld] – урожай;
3) bee [bi:] – пчела.

III. Speak on the role of pollination.

Text 22

I. Read the text and state what information it carries

Springwood[1] and Summerwood[2]

The inner part of the growth ring formed first in the growing season is called springwood or early wood and the outer part formed later in the growing season, summerwood or late wood. Actual time of formation of these two parts of a ring may vary with environmental[3] and weather conditions[4]. Springwood is characterized by cells having relatively large cavities[5] and thin walls. Summerwood cells have smaller cavities and thicker walls. The transition[6] from springwood to summerwood may be gradual[7] or abrupt[8], depending on the kind of wood and the growing conditions at the time it was formed. In some species, such as the maples[9], gums[10], and yellow-poplar[11], there is little difference in the appearance of the inner and outer parts of a growing ring.

When growth rings are prominent, as in the southern yellow pines, springwood differs markedly[12] from summerwood in physical properties[13]. Springwood is lighter in weight, softer and weaker than summerwood. Because of[14] the greater density of summerwood, the proportion of summerwood is sometimes used to judge the quality or strength[15] of wood.

II. Remember the following words:

1) sprigwood ['sprɪŋ'wud] - весняя древесина;
2) summerwood ['sʌmə'wud] -летняя древесина;
3) environment [ɪn'vaɪərənmənt] - окружающая среда;
4) condition [kən'dɪʃn] - условие, обстоятельство;
5) cavity ['kævɪtɪ] - полость, впадина;
6) transition [træn'sɪʒn] – переход;
7) gradual ['grædjuəl] – постепенный;
8) abrupt [ə'brʌpt] – внезапный;
9) maple [meɪpl] – клен;
10) gum [gʌm] -эвкалипт, резина;
11) yellow-poplar - лириодендрон тюльпанный;
12) markedly ['ma:kɪdlɪ] – заметно;
13) property ['propətɪ] – свойство;
14) because of - из-за;
15) strength [streŋθ] - прочность, крепость.

III. Make up 5 questions covering the main points of the text.

Text 23

I Read the text and say what it is about

Sapwood[1] and Heartwood[2]

Sapwood contains living cells and has an active part in the life processes of the tree. It is located next to the cambium and functions in sap conduction and storage of food.

The sapwood layer may vary in thickness and in the number of growth rings contained in it. Sapwood commonly ranges[3] from 1.5 to 2 inches[4] in radial thickness. In certain species, such as chestnut[5] and black locust[6], the sapwood contains very few growth rings and sometimes does not exceed[7] one half inch in thickness.

Heartwood consists of inactive cells formed by changes in the living cells of the inner sapwood rings, presumably after their use for sap conduction and other life processes of the tree have largely ceased.

The cavities of heartwood also may contain deposits of various materials that frequently give much darker colour to the heartwood. All heartwood, however, is not dark coloured.

II. Remember the following words:

1) sapwood ['sæpwud] – заболон;
2) heartwood ['ha:†wud] – сердцевина;
3) range [reind3] - колебаться в определенных пределах;
4) inch [int] – дюйм;
5) chestnut ['†ʃ esnʌ†] – каштан;
6) locust ['louk∂s†] - робиния, лжеакация;
7) exceed [ik'si:d] – превышать.

III. Answer the following questions.

1. What are the functions of sapwood?
2. How thick is sapwood layer?
3. What are the inactive cells of sapwood formed by?
4. What do the cavities of heartwood contain?
5. What determines the colour of heartwood?

IV. Mention the features which make sapwood different from heartwood.

Text 24

I. Read the text and state what it is about.

Ecological Factors

The growth of the plant is influenced by many factors, among the most important of which are water, soil, light and temperature.

Plants cannot live without water which is the most abundant[1] constituent in most plants and also one of the most important. Lack[2] of water may prevent the spread[3] of a species into a territory when all other factors may be satisfactory. This is well illustrated by the great desert[4] regions of the world, which produce abundant vegetation[5] when irrigated.

Most plants with which we are familiar grow in the soil. The soil in which plants live must have a suitable[6] texture[7] and must furnish[8] certain elements which constitute most of the crude food materials[9] of the plants.

The most important elements in the soil which either serve as food or influence the growth of plants are phosphorus[10], potassium[11], calcium[12], magnesium[13], sulphur[14], iron[15], sodium[16], chlorine[17], silicon[18], manganese[19], aluminium[20] and nitrogen.

Light is also an important factor. But while some plants grow best in the direct rays of the sun, others are always found growing in shady[21] places (e.g. mosses[22] and ferns[23]). Coffee[24] is very generally grown in the shade of larger trees and many plants are grown in an artificial shade.

Temperature is another factor of plant growth, and many plants are limited in their range by it.

II. Remember the following words and word combinations:

1) abundant [ə'bʌndənt] - обильный, изобилующий;
2) lack [læk] - недостаток, отсутствие чего-либо;
3) spread [spred] – распространение;
4) desert ['dezət] – пустыня;
5) vegetation ['vedʒi"tein] – растительность;
6) suitable ['sju:t əbl] - подходящий, соответствующий;
7) texture ['tekst ʃə] - строение, текстура;
8) furnish ['fə:niʃ] - снабжать, доставлять;
9) crude [kru:d] food material - питательное сырье;
10) phosphorus ['fosfərəs] – фосфор;
11) potassium [pə'tæsjəm] – калий;
12) calcium ['kælsiəm] – кальций;
13) magnesium [mæg'ni:zjəm] – магний;
14) sulphur ['sʌlfə] – сера;

15) iron ['aiən] – железо;
16) sodium ['soudjəm] – натрий;
17) chlorine ['klo:ri:n] – хлор;
18) silicon ['silikən] – кремний;
19) manganese [ˌmæŋgə'ni:z] – марганец;
20) aluminium [ælju'minjəm] – алюминий;
21) shade [eid] – тень;
22) moss [mos] – мох;
23) fern [fə:n] –папоротник;
24) coffee ['kofi] – кофе.

III. Make up a list of chemical elements mentioned in the text.

IV. Explain the following statements.

1. Plants cannot live without water.
2. The soil must furnish certain elements.

V. Answer the following questions.

1. What factors is the growth of the plant influenced by?
2. What accounts for the existence of the great deserts of the world?
3. What elements in the soil are the most important for plants?
4. Why are these elements so important?
5. What light conditions do mosses and ferns require?

Text 25

I. Read the text and state what information it carries.

The Nature of Soil Organic Matter

The organic matter of the soil primarily consists of extensively decomposed[1] residues[2] of the vegetation that occupied the land under virgin[3] conditions. The decomposition of the plant materials that gave rise to these residues is brought about[4] by the activity of the microorganisms of the soil. These microorganisms themselves make a contribution to the organic matter in the form of living and dead cells and residues the latter. Soil organic matter is, therefore, predominantly plantderived[5] but extensively transformer by microorganisms.

The natural decomposition of plant materials that occurs in and on the soil is not an undesirable process but one that keeps continually in circulation the raw materials[6] needed for plant life and crop production. The materials of which

plants are built are carbon dioxide from the air, water,nitrate[7] and other nutrients[8] from the soil. In the process of decomposition of plant residues, the microorganisms again release the carbon dioxide and plant nutrients, so making them available for further plant growth.

Some of the constituents of plants are readily[9] and quickly used as food by the soil microorganisms; others are more resistant and are attacked only comparatively slowly. It would be incorrect to regard soil organic matter as just an accumulation of wholly unusable unavailable or inert residues from plants. It is instead an accumulation of material that is not readily used by the microorganisms and which in consequence[10] ordenarily undergoes[11] only slow change. After the first rapid phase of decomposition when the plant residues are rapidly attacked, biological activity slakens. There are reasons for believing that the nitrogen content and the lignin content[12] of plant materials may particularly affect the amount and composition of the organic residues ultimately remaining. Nitrogen is present in plants as protein.

II. Remember the following words and word combinations:

1) decompose [ˌdi:kəm'pouz] - разлагаться, гнить;
2) residue ['rezidju:] - осадок, остаток;
3) virgin ['və:dʒin] - девственный, нетронутый;
4) to bring about – осуществлять;
5) plant derived - появившийся от растений;
6) raw material – сырье;
7) nitrate ['naitreit] – нитрат;
8) nutrient ['nju:t riənt] - питательное вещество;
9) readily ['redili] - легко, быстро;
10) in consequence ['konsikwəns] - в результате;
11) undergo [ˌʌndə'gou] - подвергаться, испытывать;
12) lignin content ['lignin'kont ent] - содержание лигнина.

III. Suggest the Russian for:

decomposition of the plant materials; to be available; to keep the raw materials in circulation; to be extensively transformed; to have reasons for believing.

IV. Suggest the English for:

относительно медленно; разложение остатков растений; рассматривать что-либо как...; дать начало чему-либо; внести вклад.

V. Supply extended answers to the following questions.

1. What does the soil organic matter consist of?
2. What is the decomposition of plant materials brought about?
3. Why is the natural decomposition of plant materials a desirable process for plants?
4. What constituents of plants are accumulated in the soil?
5. When does biological activity of plant residues slacken?

VI. Speak on the importance of microorganisms for the formation of soil organic matter.

Text 26

I. Read the text and say what information it carries.

Soil - a Medium for Plant Growth

Soil, which is present as a thin layer over a large area of the earth, provides the water and mineral salts which plants require as food material. It is through the roots, which are embedded in the soil, that plants take up this food. The soil is highly important to man, who relies on it. The soil has been formed by the breaking down or weathering of rocks. This is a very slow process. When water freezes it expands, and when it happens in the crevice[1] of a rock the crack may be enlarged and pieces of rock fall to the ground. The heating[2] and cooling[3] of the rock causes expansion[4] and contraction which also helps to break them up. Many of the materials of which the rocks are made are insoluble but some are dissolved by water, especially when it contains carbon dioxide.

Most rocks are not made up of one material, so that some parts may be dissolved by rain and in this way the insoluble rock is broken into a mass of fragments. These fragments are often reduced by friction[5] as the wind, rivers and sea move them about.

The small particles of mineral matter from the skeleton[6] of the soil.

Mosses and small flowering plants may grow between the fragments. As these plants die they from humus[7], and the addition of humus to the tiny rock fragments forms the familiar soil. Soil is a complex mixture of various chemical substances together with a very large number of small animals and plants. It is easy to show the presence of the main constituents[8] by a very simple experiment. A weighed sample[9] of soil is put to dry on a tray, left near a radiator for about two days, and then re-weighed. You will find that there has been a loss of weight owing to[10] evaporation of water.

The soil water contains oxygen dissolved from the air between the soil particles and salts dissolved from the mineral particles and humus. The presence of these mineral salts can be shown by adding distilled water to a

sample of soil, mixing, filtering and evaporating the filtrate. The residue of mineral salts include the sulphates[11], phosphates[12], and nitrates of potassium, calcium, magnesium, and iron, many of which are essential for plant growing.

A typical soil contains the following six constituents:

1. Mineral particles.
2. Humus.
3. Water.
4. Dissolved mineral salts.
5. Air.
6. Microorganisms.

II. Remember the following words and word combinations:

1) crevice ['krevis] - трещина, расщелина;
2) heating ['hi:tiŋ] – нагревание;
3) cooling ['ku:liŋ] – охлаждение;
4) expansion [iks'pæ nʃn] – расширение;
5) friction ['frikʃ n] – трение;
6) skeleton ['skelitn] - (зд.) основа:
7) humus ['hju:mɔs] - гумус, перегной;
8) constituent [kɔn'st it juɔnt] - составная часть;
9) sample ['sa:mpl] – образец;
10) owing to ['ouiŋ't u:] - благодаря, вследствие; по причине;
11) sulphate ['sʌlfeit] – сульфат;
12) phosphate ['fosfeit] – фосфат.

III. Explain the meaning of the following terms

1. Soil.
2. Humus.

IV. Make up a list of chemical elements mentioned in the text.

V. Describe the two experiments mentioned in the text.

VI. Sum up what the text has to say on the following points

1. The role of soil in the life of plants.
2. The process of soil formation.
3. The main constituents of soil.

II. READING AT HOME

1. Translate the Texts in Writing

Text 1

Do you know ...

... if a flower sleeps at night?

The answer to this question is yes; plants go to sleep at night.

Animals depend on plants and trees for the air which they breathe, and plants and trees depend on animals for the air which they breathe.

Plants take in carbonic acid, which contains the carbon from the air. They use the carbon and give off the oxygen, and so they material for the life of animals. Animals breathe out carbonic acid so they from material for the life of plants.

We may say that we cannot live without plants, and plants cannot live without us.

When the sun is shining, the plant takes the carbonic acid from the air and gives off the oxygen. When the night comes, the plant stops taking in the carbonic acid; while it is sleeping, it gives off its carbonic acid and takes in the oxygen though in less quantities than by daylight.

A plant takes its food in the day and grows both during the day and during the night. Pollen is brought to many flowers by insects. Some insects sleep in the day and work at night. These insects visit the night flowers and bring them the pollen they need.

Text 2

Golden glow of the lesser celandine[1]

I

A sunny bank, glowing with golden lesser celandine flowers is a welcome sign that spring is on its way.

Sunligth is reflected from its smooth, heart-shaped leaves as well as from its flowers, thus contributing to the sparkling appearance of the bank.

Adventurous bees, attracted by the shining yellow petals, fly from flower to flower, sucking the nectar produced by nectaries found at the base of each petal.

The numerous yellow stamens open outwards, thus ensuring a thorough dusting of pollen on the hairy heads of the visitors, as they push their long tongues between the petals and stamens.

After fertilization, the green ball of ovaries in the centre of the flower turns into a group of one-seed fruits like those of the buttercup[2].

II

A carpet of celandine may be found in a shady damp hollow, where insects are few. In such a sport the plant depends as much on its roots as its seeds to colonise the ground.

Its weak stems trail over the ground and in the leaf axils small tuberous[3] growths arise.

They develop hairs on their surface, which help them to absorb moisture from the air and the soil, and they contain a store of starchy food.

They use up the food, pushing their way down into the soil and trusting up small shoots that bear leaves and buds.

When the old stems die away at the end of the season, each of the new shoots will form an independent plant.

A secret of the success of the celandine lies in its storage of food at the end of the season in a group of tuberous roots at the base of its stems.

This food store enables it to develop early, before the shade of larger plants becomes too dense to allow lowgrowing plants to obtain sufficient sun to enable them to make their carbohydrate foods.

Although celandine may spread over a whole hedge bank or shady hollow, they rarely encroach on gardens to from a problem for gardeners, like their relations the buttercups do.

Strangely enough the plant called the greater celandine is not related to the lesser celandine, but belongs to the poppy[4] family.

It has yellow flowers and rough divided leaves, and does not flower till June. When the stems are broken a yellow juice comes out, which resemble the milky juice of poppies or dandelions[5]. This is acrid and poisonous.

Notes

1) celandine ['seləndain] – чистотел;

2) buttercup ['bʌt əkʌp] – лютик;
3) tuberous ['t ju:bərəs] – клубневый;
4) poppy ['popi] – мак;
5) dandelion ['dændilaiən] - одуванчик лекарственный;

Text 3

Lesser Celandine

I

This is a common perennial herb found in woods, meadows, grassy banks and along the sides of streams. Many of you know its familiar yellow flowers which appear in March, April and May. If you dig up a plant in December you will see that it has several swollen pale brown root tubers[1] which are attached to

a very short stem. These are the roots of the previous year's growth which have collected a store of starch in the early summer.

Test for this store in the usual way with iodine solution. You will also see some new thin white roots growing from the stem above the attachment point of the root tubers. At this time the stem is very short and is seen clearly only when it is cut down the centre because it is surrounded by white scale leaves and by the bases of the young leaves which a rosette.

At this stage, only the tips of the outermost leaves will be visible at the soil surface, and the buds, which will grow into the next year's leafy stems, are well below. It is difficult to see them because they are minute, and they lie on the stem tucked away inside the sheaths formed by the bases of the leaf stalks. The arrangement of leaves and buds in their axils is more obvious if you examine a well-grown plant at the time of flowering, when the length of the main stem is several centimetres.

II

In June the aerial parts of the plant, i.e. the parts above ground, start to die off. They have a period of rest during the autumn but start their new growth early in the year. This helps them to make their food before they get overgrown by other taller plants which make new growth later in the year.

So far we have considered only perennial plants i.e. plants in which individual plants survive for several years. But you will realize that even annual[2] plants such as field poppy, shepherd's purse[3], and groundsel[4] perennate as seeds. The seeds contain a store of food and a young shoot (really a bud) protected inside the seed coat. Of course, perennial plants also survive the winter in the form of seeds.

Biennial[5] plants are those which take two years to complete their growth and set seed. Familiar examples are the corrot[6] and parsnip[7]. The carrots are the tap roots of the first-year plants form which the leaves and lateral roots have been stripped. Examine a carrot to find out how its buds are protected (preferably a carrot still in the ground). Where does it store food, and what happens to the plant if is left to grow a second year?

Notes

1) tuber ['t ju:bə] – клубень;
2) annual ['ænjuəl] – однолетний;
   perennual [pə'renjəl] – многолетний;
3) shepherd's purse ['ʃ epədz'pə:s] - пастушья сумка;
4) groundsel ['graunsl] – крестовник;
5) biennial [bai'eniəl] – двухлетний;
6) carrot ['kærət] – морковь;
7) parsnip ['pa:snip] - пастернак посевной.

Text 4

The Golden Weed In The Green Meadow

What a wealth of beauty June provides. The fresh green of the beech[1] and larch[2], grey-green of willow[3], the tips of the oaks[4] tinged with red, silvery white beams with stretches of green young corn or golden buttercup[5] meadows at their feet.

Buttercups are beautiful, but gardeners do not welcome them, for the creeping buttercup[6] is a most persistent weed.

It sends runners, which root and from new plants, so that if one plant is missed during weeding it will quickly cover the ground again.

The three commonest buttercups are all troublesome weeds, although the creeping buttercup is the only one which spreads over the ground by runners.

All of them produce numerous one-seeded small fruits from the many ovaries in the centre of the flower.

Masses of pollen are shed from their many stamens on to insects that visit them for the nectar they produce at the base of each petal so there is every chance of their ovules being fertilized.

All of them grow best on heavy soils, but the bulbous buttercup will also grow on chalk.

The bulbous buttercup differs from the other two, not only because of the swollen base of its stem, but also because its sepals are bent back against the flower stalk, while those of the others rest against the five bright yellow petals.

The common buttercup has neither runners nor a swollen stem and its flower stalk is smooth instead of being furrowed.

In the group Ranunculus, to which they belong, are a number of other common, wild flowers. The flowers are all very similar, but the leaves show considerable differences.

Buttercup leaves are much divided, but spearwort has grasslike leaves, while the lesser celandine has heart-shaped ones.

Water crowfoot, which makes a pond or the edges of a stream look as if covered in a sheet of white, is another common Ranunculus.

Its white flowers rise above the surface of the water and shiny three-lobed leaves float on the surface, while under water are finely-divided leaves, which offer no resistance to the flow of water.

The whole plant is riddled with air passages, so that it easily floats and its under-water parts are well supplied with air.

Notes

1) beech [bi:t] – бук;
2) larch [la:t] – лиственница;
3) willow ['wilou] – ива;
4) cak [ouk] – дуб;
5) buttercup - лютик; corn buttercup - лютик полевой;
6) creeping buttercup - лютик ползучий;

Text 5

Bulbous Buttercup[1]

There are exceptions to almost every general statement made about living things, and to illustrate this point we have included the bulbous buttercup. It is an exceptional plant because it passes a large part of the summer in a resting state below ground. First we must learn to distinguish it from the two other very common buttercups among which is frequently found growing in old meadows.

The reason why buttercups are so common in old meadows is that cattle avoid eating them as they contain a substance which raises blisters[2] on their tongues and lips, and produces ulcers[3] in their stomachs[4].

The bulbous buttercup is unfortunately named; its underground part is a corm[5], not a bulb[6], because it does not have the separate fleshy layers of a typical bulb. It is simply a swollen globular stem containing a lot of starch and surrounded by a few decaying remnants[7] of leaf stalks.

In this it rests in the ground through most of summer, but, in the autumn, a lateral bud grows out to form a new corm below ground and a rosette of leaves above. During March and April more leaves are produced from the new corm, and the buds, which have till now been protected underground in the axils of leaves whose bases sheath the corm, grow out to from flowering shoots. By the end of June fruits are dispersed and the plant dies off leaving a scar on the new corm. Meanwhile the old corm has decayed into a slimy mass. Thus no part of the plant survives for more than one year, but there is a continuous annual cycle of replacement.

Notes

1) bulbous buttercup ['bʌlbəs 'bʌt əkʌp] - луковичный лютик;
2) blister ['blist ə] – волдырь;
3) ulcer ['ʌlsə] – язва;
4) stomach ['stʌmək] – желудок;
5) corm [ko:m] – клубнелуковица;
6) bulb [bʌlb] – луковица;
7) decaying remnants [di'keiiŋ 'remnənts] - гниющие остатки.

Text 6

The Woodland Ballerina

It is seven weeks since the shortest day and the sun gives a pleasant warmth when there is one of those mild days that February often brings to deceive us into thinking that spring has come.

A look round garden shows that the snowdrops[1] are showing white buds that will soon break through their protective sheath.

When they bend over and open their petals exposing their yellow stamens, there may be few insects about to visit them, pollinating them, as they suck their nectar.

The flowers remain open many days before their petals begin to fade but often few seeds form from the numerous ovules in their little green ovaries.

Although the increase in numbers of snowdrop bulbs does not take place so fast as in the case of tulips or daffodils[2], it is probably the chief cause of the striking masses growing in old-established gardens where the leaves are allowed to die down without interference or premature tidying up.

The food made in the pair of leaves that surround each flower stem goes down to the base of the leaves, which swell to form the food store for next year's growth.

Each bud can produce a new bulb, so over the years a row of snowdrops can become a carpet, even without the help of seeds.

If single snowdrops set few seeds, because they are out too early for bees to help in pollinating them, the double snowdrops, which have sacrificed their stamens to make their extra petals, must depend even more upon their bulbs for reproducing themselves.

Their mass of petals makes them look like little ballet dancers with a green bodice and a mass of frilly white petitcoats.

Notes

1) snowdrop ['snoudrop] - *подснежник снеговой, ветреница пятилистная;*

2) daffodil ['dæfədil] - *нарцисс желтый, лженарцисс.*

Text 7

It Turns Toward The Sun

Sunflowers[1] and artichokes[2] belong to the same family of plants - the composites[3]. But there are three kinds of artichoke: the Jerusalem artichoke[4], the globe[5] artichoke and the Chinese artichoke[6].

The latter is not a composite and now is not often seen or eaten. The globe artichoke is a thistle[7], whose flowers are eaten with melted butter as a luxury. It is mentioned by Pliny in the Natural History, which he wrote early in the first century A.D.

The Jerusalem artichoke is a true sunflower, for its name Jerusalem is an Italian mispronunciation of "Girasole", the sunflower. In Britain it only flowers when we have had an exceptionally good summer, and it then has a small flower similar to that of the perennial[8] sunflower.

This artichoke is grown for its tubers, which cluster round below ground at the end of the tall stem like knobby potatoes[9]. But, unlike potatoes, which are full of starch, the artichoke tubers contain inulin[10] - a different carbonhydrate.

Notes

1) sunflower – подсолнечник;
2) artichoke ['a:t it ouk] – артишок;
3) composite – сложный;
4) Jerusalem artichoke - земляная груша, топинамбур;
5) globe artichoke = artichoke;
6) Chinese artichoke - хорога, чистец клубненосный;
7) thistle [θisl] -бодяк, артишок;
8) perennial [pə'renjəl] – многолетний;
9) knobby potatoe - клубневый картофель;
10) inulin – инулин.

Text 8

Tulip

The tulip is a plant with bell-shaped and mildly scented flowers.

Tulips are strange plants: they can walk. If you plant them in dark, shady places, where it in cold and damp, they will walk away from the dark place into the sun. The bulb does not actually move but its substance is transfered little by little, until only the outer wrapping of brown tissue is left. The bulb sends out a delicate shoot that runs below the ground till it has reached a distance of several inches. Then near its point a swelling begins to take the shape of a tulip bulb which grows larger and larger as the food-material of the old bulb is brought into it. This is done by the little shoot. If the sunny or light spot towards the tulip is walking gets unexpectedly shaded, it will immediately begin to move in some other direction.

The Dutch have always loved tulips. In the 17th century there was a craze in Holland for the cultivation of the flowers which spread like an epidemic; bulbs in those days were sold and resold at fabulous[1] prices[2].

Notes

1) fabulous ['fæbjuləs] – баснословный;
2) price [prais] – цена.

Text 9

Iris[1]

The iris is an ornamental plant remarkable for its handsome delicately-scented flowers and sword-shaped leaves. The iris and the daizy[2] differ in this that the daisy opens widest when the sun is at its height and shuts altogether when the sun goes down; while the iris opens widest in darkness and closes when the sun shines full upon it.

The iris has a peculiar history. The Greeks believed this flower to be personification of the rainbow[3] and gave it the name of the goddess[4] of the rainbow. At one time the iris was used for making scents and powders and as a remedy[5] for many diseases[6]. In the 19th century a French scientist discovered that the seeds of iris when well roasted made a drink very much like coffee.

It is worth while mentioning, too, that when the iris root is dried, powdered and distilled it has the smell of violets.

Notes

1) iris ['aiəris] – ирис;
2) daisy ['deizi] – маргаритка;
3) rainbow ['reinbou] - радуга;
4) goddess ['godis] – богиня;
5) remedy ['remidi] – лекарство;
6) disease [di'zi:z] – болезнь.

Text 10

Poppies

Poppies are very old flowers. The ancient people thought that they were made by Somnus, the god of sleep, to help the goddess Ceres[1] in her cares and to make her sleep.

Farmers, however, do not like to see poppies among their crops because they rob the soil of the nourishment which the crops need. It is difficult to get rid of them. Their seeds germinate after 24 years. This is not surprising because the poppy is a very hardy[2] plant. It was brought to Britain by the Romans. It grows as a wild flower in all the Mediterranean countries and in the Middle East.

People found poppy capsules[3] on the sites of prehistoric dwellings. It shows that the plant is cultivated for centuries, partly for its edible seed. The athletes ate poppy seed when they trained for the early Olympic games, mixing it with wine and honey.

Bread glazed with the yolk[4] of egg and sprincled with poppy seed for ornament and flavour became popular.

Morphine, the pain killing drug, which is used medicine, is made from the juice obtained from the unripe head or seed capsule of the white poppy. When it is dried, the juice becomes opium[6], which the ancients used as a medicine.

The poppy became a symbol of peace after the First World War. Britons wore them to recall to mind those who died in the two world wars.

Notes

1) Ceres ['siəri:z] – Церера;
2) hardy ['ha:di] – выносливый;

3) capsule ['kæpsju:l] - семенная коробочка;
4) glazed with yolk [jouk] - глазурованный желтком;
5) morphine ['mo:fi:n] – морфий;
6) opium ['oupjəm] – опиум.

Text 11

Madonna Lily[1]

The beautiful madonna lily is one of the oldest domesticated[2] plants because it already existed 3000 years B.C. Ancient people who lived 1750-1600 years B.C. liked this lively lily and showed it on their works of art.

The Assyrians[3] and other Eastern Mediterranean people know of it. The Phoenicians[4], who were the greatest sailors if the ancient world, probably carried the lily westwards.

Probably, the lily was brought to Britain by the Romans but the first record of it was made in the 10th century. However, the name madonna lily was given to the flower only in the 19th century.

Notes

1) madonna lily [mə'donə'lili] - белая лилия;
2) domesticated [də'mestikeitid] – культивированное;
3) Assyrians [ə'siriənz] – ассирийцы;
4) Phoenicians [fi'niʃ jənz] – финикийцы.

Text 12

Wallflowers

Let us examine some young wallflower plants. You will notice immediately that the plant has two distinct parts - the root system which is not green and has no leaves and the shoot system which is composed of green leaves and stems.

The root systems of wallflowers consists of a main or tap root which grows more or less vertically downwards with several lateral roots growing out from it. If you use a hand lens you will see that each lateral root issues from a slit in the tap root where it has burst its way out; also they are arranged in four rows. Much smaller roots growing in all directions branch from the lateral roots. It is very unlikely that you will be able to see any root hairs growing out near the tips of the finest roots because these are usually broken when the plant is dug up. If you want to see what these hairs look like, sow a few mustard or cress seeds[1] on damp blotting-paper and keep them in a moist atmosphere for a few

days. They will soon germinate and part of the roots will be covered with a white furry mass of root hairs unobscured by soil.

The root hairs are important because they absorb water and dissolved substances from the soil. Another important job of the root system is to anchor the plant.

The main stem and leaves will be obvious to everyone. Examine the leaves, starting from the bottom of the main stem and working up. Evidently the lowest leaves are the oldest for they are dying and losing their dark green colour, but the upper leaves are fresh and green. If the plant is not too young there will be leaf scars right at the base of the main stem where old leaves have fallen off.

Now trace the leaves right to the uppermost tip of the main stem where they become so small that you will not distinguish them. Apparently new leaves are constantly produced from the stem tip which is called a growing point. If the main stem ends in a series of flowers, look at one of the branches of the main stem to see a growing point surrounded by its cluster of tiny leaves.

Next notice on the young part of the main stem the ridges running down from the point where the leaves are attached. How many ridges are there at any one point on the stem? Cut across the stem with a razor blade to check your answer. You will imaginary line up the stem passing through the point where each leaf is attached. It is a spiral line and so we say the leaves are spirally arranged.

What do you notice in the angle between a leaf and a stem? There is either a small bud or a small bud or a recognizable stem with leaves, i.e. a lateral branch of the main stem. You will see that buds do not arise anywhere on the stem but just above the point of leaf attachment, or in the axil[2] of a leaf. Not all buds are able to grow into new branches because the plant never has enough food; some always remain dormant and small.

Notes

1) cress seeds - семена кресс-салата;
2) axil ['æksil] – пазуха.

Text 13

It's Azalea[1] Time At Cypress[2] Gardens

The brilliant and beautiful azalea collection at Cypress Gardens has inspired many thousands of visitors to plant these delightful decorative shrubs in their own gardens. Azaleas are not limited to the south. They will grow in all climates from Florida to Canada, and they offer a tremendous variety of colours and growth patterns. The azalea is truly an adaptable shrub.

Cypress Gardens offers many different varieties, including native American species, as well as those originally imported from Japan and India.

Versatility is another attribute of the azalea. They can be used in hedges and for screening, as border or foundation plantings. Certain lowgrowing varieties are particularly suitable for border planting (Red Wing, Vivid, Celestine, Duc de Rohn and White Duc), while others seem specifically designed for the delicate proportions of the Japanese garden.

The most popular varieties are evergreen, with colourful, abundant bloom.

Azaleas are hardy shrubs and wind exposure is rarely a problem. Colours run the gamut from pure white through pink, rose, purple, crimson, salmon, orange-scarlet and variegated.

The height of the azalea season is generally from December to April, but now the great new varieties have some blossoms the year round.

Notes

1) azalea – азалия;

2) Cypress ['saiprəs] – Кипр.

Text 14

The Birch[1] And Other Trees

The birch is the "Lady if the Woods", and more that deserves the name, for there are few British trees so graceful and beautiful. Its silvery bark has caused the tree to be christened the "Silver Birch", and winter cannot rob the tree of its beauty, for even the branches are slender and delicate. The leaves are small, broad at the base, and narrowing to a sharp point at the apex. Borne on thin stalks, the slightest breeze will cause them to quiver like an aspen[2].

The last-named tree is a variety of the poplar[3]; the quivering of the leaves, which are broadly elliptical in shape with dented margins, has given rise to the saying, "trembling like an aspen", and is due to the thinness of the leaf stalks. The leaves become almost white on the lower side, and the waves of white, when a breeze sets the leaves in motion, produce a pleasant effect.

The leaves of the white poplar are also white on the underside, but the tree is larger than the aspen, which usually reaches a height of only fifty feet, while the limit of the growth of the white poplar[4] is about a hundred feet. The bark is smooth and grey on the upper part of the trunk, pitted with lozenge-shaped marks, while the lower part has a number of vertical ribs. The leaves vary in shape; the upper side is dark green, while the lower side is covered with a white down[5]. The absence of this white down has caused another variety of the poplars to be known as the black poplar[6]; in June the seed capsules of the female of this tree are lined with a white cotton.

Notes

1) birch [bə:tʃ] – береза;

2) aspen ['æspən] – осина;

3) poplar ['poplə] – тополь;

4) white poplar - тополь белый, тополь осинообразный;
5) down [daun] – пушок;
6) black poplar - осокорь, тополь черный.

Text 15

Gymnosperms[1]-Class Gymnospermal The Pine[2]

The familiar pine tree is the sporophyte. It resembles the other evergreens (firs[3], hemlocks[4], cedars[5] and spruces[6]) in general structure, but differs from them in the arrangement of the needles. These are grouped in clusters of from two to five, and are surrounded at the base by a whorl of scales[7].

Male and female cones[8] are produced on the same tree. The female cone is called carpellate (pistillate) cone, or the macrosporangiate strobilus; the male cone, the staminate, or microsporangiate strobilus. On these strobili, the macro- and microsporophylls are grouped spirally about a central axis. The carpellate cones are the familiar pine cones, and are much larger than the staminate cones. They remain on the tree for two years. The staminate cones appear in the early spring in terminal clusters on some of the branches. The cones develop on the clusters laterally. At the end of a few weeks these shed the pollen and drop to ground.

The life history of the pino occupies the greater part of two years. In the spring of the first year pollen grains are formed and scattered widely by the wind. The few which come in the vicinity if the carpellate cones are shifted through the openings between the sporophylls and come to lie close to the opening of the micropyle. A swelling of the tissue about the micropyle serves to imprison some of the pollen grains, and in the course of the following year a pollen type will reach the ovule.

At the time of pollination, the macrosporangium (ovule) consists of a mass of tissue, the nucellus, and integuments. In the nucellus tissue the macrospore mothel cell produced twenty-four macrospores. Only one of these remains to produce the macrogametophyte tissue in which the archtgonia develop. The process takes a year. When the pollen tube completes its slow growth into the nucellus, the egg is mature in the archegonium, and union of the nuclei takes place to form the zygote.

Immediate development then takes place and a proembryo is formed. Late in the second year the mature seed drops from the tree.

Notes

1) gymnosperms - голосемянные растения;
2) pine – сосна;
3) fir – пихта;
4) hemlock ['hemlok] - болиголов, тсуга; гемлок;
5) cedar ['si:də] - кедр, можжевельник, туйя, кипарис;
6) spruce [spru:s] – ель;
7) scale [skeil] – чешуя;
8) cone [koun] – шишка.

Text 16

Horse-Chestnut[1] Tree

1) Everyone knows that horse-chestnut trees drop their leaves in autumn and have prominent sticky buds throughout the winter. This plant's leaves are delicate and lose water to the air rapidly by evaporation, so their fall will appreciably reduce the amount of water required by the plant. The plant finds most difficulty in obtaining large supplies of water in winter since the roots cannot absorb it quickly when the soil is cold. Casting off[2] the leaves in autumn is an advantage to this plant.

2) Find a winter twig[3] of horse-chestnut and examine it carefully. You will see that the buds are in oppositive pairs above horseshoe shaped scars[4] left by the leaves. These scars are covered by waterproof bark which formed across the base of the stalk shortly before leaf-fall[5]. The small dots within the leaf scar are the blocked ends of the "pipe-line" cells which conveyed water to the leaf. You will also notice slit-like[6] scars scattered over the bark. They permit gases to pass in and out of the twig. A complete covering of bark prevents the cells which are inside the stem to get oxygen.

II

3) Now look at the buds more closely. The terminal bud[7] is the largest and it is easy to dissect it. Then dip it in methylated spirit[8] to dissolve off the sticky resin. With the help of a mounted needle take off the scales in pairs. Start at the farthest from the tip and lay them out.

4) Inside are pairs of next year's foliage leaves covered with fine hairs but you can easily recognize them by their shape. If you remove them you may also find a mass of next year's flowers. Thus next year's shoots are protected in three ways-by hairs, by resin and by scales which are cast off as the buds burst in spring.

5) Does the horse-chestnut store food through the winter? If you use a razor blade to cut a thin slice[9] across the twig, and immerse the slice in iodine solution, you will soon detect the black colour which indicates the presence of starch in certain parts.

Notes

1) horse-chestnut ['hɔ:s 'ʧ esnʌt] - конский каштан;
2) casting off – сбрасывание;
3) twig – веточка;
4) horseshoe ['hɔ:ʃʃ u:] - shaped scars - подковообразные рубцы;
5) leaf-fall - сбрасывание листьев;
6) slit-like – щелевидный;
7) terminal ['†ə:minl] bud - верхушечная почка;
8) methylated spirit ['meθileit id 'spirit] - метиловый спирт;
9) slice [slais] – слой.

2. Sum up the Information of the Texts in Writing

Text 17

History From Trees

Could the rings on the trunks of trees tell us when a lost civilisation was destroyed?

If you cut through the trunk of a tree, you will find series of concentric rings. Each represents one year's growth and the thickness of the ring will show you whether it was a good or bad growing season. Researchers at the University of Arizona, in the United States, have been using this method of counting rings on tree trunks to fix dates of changes in the climate going back thousands of years. Their evidence comes from widespread studies of a very slow-growing tree in the western United States, called the bristle-cone pine, and timber form archaeological sites. Some bristle-cone pines are thousands of years old. Other, dead trees preserved in the Arizona desert, have growth rings that overlap with those of the living trees and so extend the records even further back.

Recent experience has shown that volcanic eruptions[1] seem to affect the climate. The dust from an eruption can cut out sunlight and cause an unusual drop in temperature. This happened after the eruptions at Mount St Helens in 1980 and El Chichon in 1982. Frost damages[2] trees and the effect of frost in a tree can be seen on the growth rings in the trunk.

The tree-ring researchers found evidence of periods of frost damage covering huge areas at various times going back 4.000 years. They found that, in many cases, frost damage followed major, well-known eruptions. Krakatoa in Java, which erupted in 1883, led to severe frosts in Arizona in the following year. Tree-ring evidence shows frosts in 42 BC which may have resulted from an eruption of Mount Etna in Sicily, in 44 BC.

Records of eruptions so far back in history are less accurate that recent ones, so the evidence of the tree rings is of great interest to archaeologists. Perhaps the most interesting evidence from tree rings in one recording frost damage in 1626 BC.

The philosophers of Ancient Greece mention a great civilization which was destroyed by an earthquake[3] and sank beneath the sea.

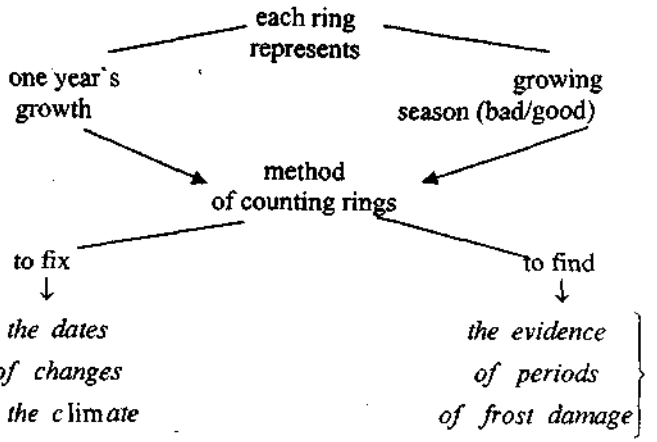
Radio-carbon dating evidence on the Greek island of Santorini, in the Aegean, has shown that it was a centre of great civilization in the seventeenth century BC, when a great eruption destroyed it. No one has known exactly when Santorini met its violent end, but the tree rings could provide an exact date.

Notes

1) eruption [i'rʌp.ʃn] – извержение;
2) damage ['dæmid 3] - повреждать, повреждение;
3) earthquake ['ə:θkweik] – землетрясение.

Use Model 3

History From Trees



Text 18

The Wonderful Storehouse[1]

There is a wonderful storehouse on our planet. If you put a sack of grain into it in the spring, twenty sacks will spring up[2] there by the autumn. One pail of potatoes will become twenty pails. A handful of seeds will turn into a huge pile of cucumbers[3], radishes[4], tomatoes[5] or carrots.

This wonderful storehouse is called the earth. In springtime the storehouse is unlocked: the field is ploughed up. Then the seeds are sown in the field. After this storehouse is locked up again: the grain is covered over with earth. In autumn the master comes to collect what the wonderful storehouse has put away for him. But the wonderful storehouse will only obey a good master. It will never treasure things for a lazy one. A lazy master gets weeds instead of grain, carrots, cabbages[6] or other vegetables. If the seeds are not sorted out, weeds will start growing very quickly.

The good master will never allow the weeds to grow in his field. There are many powerful and efficient machines which are used nowadays. In the old days a peasant never knew whether the land would support him or not, whether he would have a good crop or a bad one.

Nowadays, people don't wait for nature to give them presents, they make her give them everything she has got.

Notes

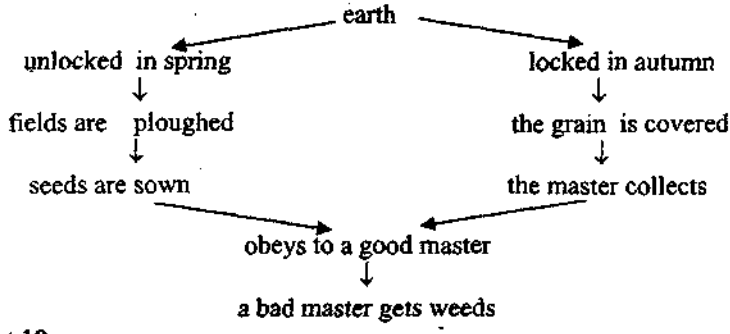
1) storehouse ['stɔ:haus] - кладовая; склад;

2) spring up ['sprɪŋ'ʌp] – возникнуть;

3) cucumber ['kju:kəmbə] – огурец;
4) radich ['rædi.ˈ] – редиска;
5) tomato [†ə'ma:†ou] - помидор, томат;
6) cabbage ['kæbid3] – капуста;

Use Model 4

The Wonderful Store House



Text 19

Raleigh's Plant

Sir Walter Raleigh, an English statesman and navigator, who lived in the reign of Queen Elizabeth, sailed across the sea to America in search of new lands and introduced the potato[1] from America into England. Shortly after getting the first crop, he sent some to a friend.

Next spring, the friend planted the potatoes, which soon gave an excellent crop. When the "potato-plums"[2], as he called them, were ripe, he took some of them to his cook, who fried them in butter, and put sugar and cinnamon[3] over them. In this condition they were set on the dinner-table as a great rarity.

The balls, however, tasted unpleasant, and it was decided that the fruit could not ripen in the cold English climate. The gardener was therefore ordered to pull up the plants and burn them, and he did so.

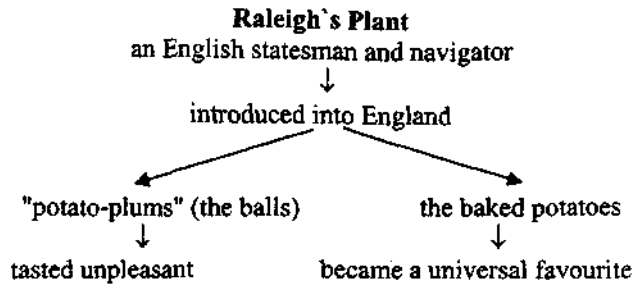
It happened that the gentleman stepped on one of the baked potatoes as it lay in the ashes. When it broke open he noticed that it was white and had an agreeable smell. He tasted and found it very tasty.

The proper method of cooking the new vegetable was soon learnt, and in a short time it became a universal favourite.

Notes

1) potato [pə't eitou] - картофель
2) plum [plʌm] - слива
3) cinnamon ['sinəmən] - корица

Use Model 5



Text 20

Learning The Language Spoken By Plants

A human being can tell world about the way he or she feels using words and gestures. Animals have voice, postures, and movement at their disposal. But what about a plant?

It has been hypothesized that vital information is conveyed by the change in plants` bioelectrical potentials, as is the case[1] in the human body with signals travelling along channels of the nervous system.

Experiments conducted in St. Petersburg at the laboratory of biological cybernetics, in the Agrophysical Institute, have shown that plants have another, and much more informative language, that of water exchange. Here is a simple proof: some two seconds after the plant is watered, its every leaf and cell respond to it, long before the water actually reaches them.

The entire plant organism is a kind of hydro-system transmitting the pressure of water to its every corner. The water running inside the plant server as a control system of its own water and artificial light requirements.

The St. Petersburg experiments have become possible thanks to new sensors designed by a member of the laboratory`s staff, Vladimir Karmanov, Cand. Sc. (Agriculture). The instruments monitor plants` water flow and measure leaf temperature and stalk diameter. Precision pickups are so light-weighted that they do not damage the plant`s finest tissues, at the same time they operate continuously, which is very important for subsequent mathematical procession of experimental data.

Diagnosis By Water Consumed

Now that the language has been found, we should think of how it can be used to communicate whit the plant.

Senior researcher Sergei Radchenko, Cand. Sc. (Biology), takes me to a vessel with a few bean shoots growing inside. Each shoot carries a miniature sensor flow rate. The signal from a "thirsty"[2] plant in transmitted to an electric

motor, which then raises a water bowl inside the glass vessel so that the roots of the plant are immersed[3]. Thus, the plant itself regulates its own water supply.

Measuring instruments fixed on various parts of the plant help observe an extremely interesting and to a certain extent "sensible"[4] organization of the process: the water is first of all supplied to the young leaves, and only then do old leaves get it. It reminds us the human rule of treating children with priority, doesn't it? In fact, the older and more sturdy[5] leaves often go without water for the sake of the tenderer[6] and more fragile[7] young ones. Sometimes, when the plant is short of water, the flow rate in the old leaves goes down, while going up in the young ones. The outflow of water from the "patriarchal" lower leaves to the upper leaves, flowers and fruits is quite a common practice, too. Measurements have shown that the difference in the flow rates in the lower parts of the plant may be as high 50 per cent, whereas in the upper storeys it is never higher than 5.

Self-watering is an excellent model for evaluating plants' adaptability to changing ambient[8] conditions. It can help assess the difficulties a plant may face if it is planned to move a crop indoors or to a different climatic zone. We can also elaborate the optimal watering timetable on the basis of our dialogue with the plant. Self-watering technique may be transplanted from the lab to the field for practical application. Choosing a few "control" specimens[9] among a large group of plants and installing measuring instruments on them, we can monitor[10] their condition in the new habitat.

A self-control Lighting System?

Another, by no means[11] less informative experiment involves plant-controlled lighting. Here again two values of water flow rate are established, one calling for[12] switching on the lights, the other, for switching them off. Thus, the plant may deliberately control the change of night and day.

The experimental data have indicated that all plants adhere to the genetically built-in 24-hour cycle and prefer it to any other artificially devised rhythms. The conclusion is not very surprising, but it is of paramount importance for, say, experiments in space, where the daylight on "space plantations" is fixed by man.

Notes:

1) as is the case - как происходит;
2) thirsty ['θɜ:sti] - томимый жаждой;
3) immerse [i'mɜ :s] – погружать;
4) sensible ['sensəbl] – разумный;
5) study ['sɜ: di] - сильный, крепкий;
6) tender ['t endə] – нежный;
7) fragile ['fræd3 ail] – хрупкий;

8) ambient ['æmbiənt] – окружающий;
9) specimen ['spesimin] - образец, экземпляр;
10) monitor ['monit ə] - (зд.) наблюдать;
11) by no means – нисколько;
12) call for – требовать.

Use Model 6

Learning the Language Spoken by Plants

1. Experiments at the laboratory of biological cybernatics
have shown
↓
plants
↓
have
↓
an informative language - the language of water exchange

2. The entire plant organism-a kind of hydro-system
↓
transmits water to its every corner

3. The plant itself regulates its own water supply

the young leaves are supplied first	the old leaves get water after

4. Low leaves give water to
↓
upper leaves
(when the plant is short of water)

5. The plant
↓
may control
↓
the change of night and day

3. Choose Any Text you Like, Translate It or Sum up the Information of It

Text 21

Theophrastus (370-286 B.C.)

Clifford c. Snyder, M.D.

Theophrastus was born in Lesbos (island of lesbians) and is often called the Father of Botany. He was born Tiranos, but Aristotle renamed him Theophrastus (the divine orator). He was the leading botanist of ancient times and remained unsurpassed until the Renaissance. He created a monumental canon (500 plant varieties) of medical botany. Inquiry Into Plants. In this text, he noted that dittany (a mini flavored plant) from the bitter bark of the devil (dita) tree, is a plant which makes labor in pregnancy easy and may stop pain altogether. From this we realize that be had some idea of anesthesia. Theophrastus wrote fluently including texts of physics, zoology, psychology, botany, art, music, ethics, politics and logic.

Text 22

Botanical Taxonomy - A Historical Summary

Introduction

Plant taxonomy arose out of people using plants, relating closely with plants, and seeing them as natural groups. The ancient groupings were what is now called artificial' groups they reflected characteristics that were readily perceivable, (like flower shape or plant size-herb, shrub, tree) rather that how plants actually evolved, and related to one another.

The names of the plants, whether scientific or common are very ancient. Many times students have resistance to learning technical names, because they seem overly artificial, are foreign, or seem devoid of rootedness in the culture. All of these names came from cultures that we arose from, such as Gaelic, or Greek. An example is the Hawthorne, Crataegus. This plant was known and widely used by the Greeks and Romans. The name comes from the Greek Kratos, meaning strong or powerful, which alludes to the healing virtues.

These scientific names considerable power, as well as being a universal language with which to communicate about particular plants among different cultures.

The word taxonomy itself comes from the Greek taxo, to put in order, or arrange. Humans have had a strong desire to classify everything in the physical

and for that matter astral and ethereal worlds. Rocks, stars, animals, plants, bacteria; all things are given a name, are related to other things of their kind. This orders the world, and makes sense out of chaos.

Text 23

Seeds And Germination

Most seeds contain less than 20% water, as opposed to about 80% in growing tissues. Most of the water in seeds is bound to macromolecules, so that little is available for metabolic reactions. Cellular membranes are disorganized under these conditions. Because the water potential of seeds is extremely low they are capable drawing water from soils that have too little water to support normal plant growth. As the seed imbibes water cell membranes reorganize and metabolism begins. However, the seed may not germinate at this point. In addition to water, many seeds require a period of cold exposure (stratification) or leaching of inhibitors by water before germination is possible. This applies particularly to wild species; many cultivated plants have been selected for ease of germination. During seed development dormancy is associated with an increase in abscisic acid; this dormancy can often be broken artificially by treatment with GA.

Germination in some seeds is promoted by ethylene. This could be related to an ecological response to fire which occurs naturally in many biomes. Burning vegetation generates trace amounts of ethylene and clears the ground for colonization by new plants.

In epigeal seedlings the apex of the emergent structure is bent over in a hook as long as it is below ground. This protects the meristem and eases its passage through the soil. Obstruction of seedling growth maintains hook closure and promotes lateral expansion to strengthen the emerging shoot. This seems to involve ethylene that is stimulated by the mechanical stress.

All the time that the seedling is in the dark it remains pale or nearly white and its leaves do not expand. When it reaches the light stem elongation is suppressed, chlorophyll synthesis and leaf expansion are stimulated under the control of the phytochrome system. When plants are covered over they return to this etiolated morphology. Chloroplasts revert to etiopiasts and leaves do not expand.

In all plants the first stages of growth involve extension from single stem and root apices. In many dicots the radicle persists to form a tap root from which lateral roots arise. In monocots the first root is soon replaced by adventitious roots from the base of the stem.

The original stem apex tends to be dominant, at least for a time. The apical buds of extending shoots suppress the growth of lateral, axillary buds. This seems to be because auxin produced in the apex travels down the stem and

prevents bud-break. In contrast, auxin in the root inhibits elongation, but promotes the initiation of laterals. Roots are a sources of cytokinins that move up the plant and tend to promote shoot initiation. This is part of the system through which plants control the balance between shoot and root.

Removal of the apical bud allows the laterals to grow out; this may be desirable in order to get a bushy plant or many flowers on one stem. At other times excessive bud break after pruning may be undesirable, in which case auxin paints can be used on the cut surface to maintain the suppression of laterals.

Side branches that grow may maintain these orientations, but commonly lateral roots and shoots grow horizontally. This does imply that they do not respond to gravity. The maintenance of growth in any definite orientation requires gravity perception.

Light has a modulating effect on plant growth. Shade tends to promote elongated growth and the development of broad, thin leaves. Light filtering through foliage is enriched in far-red so that inhibition of stem elongation by Pfr is negated.

The red/far-red system influences the amount of growth of stems and leaves, whereas the blue-light receptor influences direction. Thus plants in a dense stand or branches in a tree adjust their growth to position the foliage for optimum light capture.

Text 24

Flowering

Light perception is often involved in the control of flowering. When plants flower at a particular time of year it is usually because they respond to day-length. Not all plants are regulated in this way: "day neutral" plants will flower at any time that are able to grow. So-called "free flowering" garden plants like *Petunia* and *Impatiens* have been selected for this feature. Spring- or fall-flowering plants like strawberry and chrysanthemum tend to be short-day plants, whereas summer-flowering plants like coneflower and many grasses tend to be long-day plants. "Long and short day" are misleading terms on two counts.

- Both may flower with the same actual day-length. The long-day plant requires that the day should be **longer** than a critical period. The short day plant requires that it should be **shorter** than a critical period.
- It would be more accurate to call them "short night" or "long night" plants, since it the length of night that is important rather than the length of day.

Text 25

Fruit And Seed Development

Fruit development is usually dependent on a signal from the developing seeds, although some plants such as banana can develop parthenocarpic fruit that lack seeds. Parthenocarpic fruit set can be induced in many species by auxin, GA or cytokinin or some combination of these hormones.

Early seed development is associated with cell division and synthesis, so that immature seeds contain hormones associated with growth, auxin, GA and cytokinin. As seeds mature they usually begin to desiccate, abscisic acid increases and dormancy sets in.

Senescence

Although we may find it undesirable, senescence is a natural part of plant development, and, like other aspects of development it is under genetic and hormonal control. Patterns of senescence vary from one plant to another.

- In monocarpic senescence the whole plant dies after seed formation. This is frequently observed in annuals (therophytes in Raunkiaer's terminology) and biennial plants, but some perennials such as the century plant *Agave americana* show monocarpic senescence.
- Woody plants (phanerophytes) in temperate regions often show a deciduous pattern of senescence in which all of the leaves die at the same time as the meristems become dormant. The leaves are replaced by a whole new set at the end of dormancy in the spring.
- Sequential senescence is a feature of evergreen plants, particularly those that grow throughout the year. Leaves are continuously produced and shed in order of age.

However senescence occurs, the underlying changes are very similar. There is a switch from synthesis to breakdown of cell structure. Photosynthesis declines as the chloroplast becomes a chromoplast. Proteins and other polymers are broken down by digestive enzymes. In perennial plants most of the amino acids and other small molecules are withdrawn from the leaves before they are shed. In this way the plant recovers some of its investment.

Senescing plant parts ofter produce ethylene and senescence is generally promoted by ethylene or ethylene-releasing compounds. One of the major uses of ethrel is to promote senescence of tobacco leaves prior to harvest.

Text 26

Dormancy

In perennial plants senescence of some of the plant structure is associated with dormancy in the over-wintering structure. Dormancy is a phase in which cell division and cell expansion are suspended. Plants can stop growing for various reasons without being really dormant; perhaps the temperature is too low or there is not enough water light or nutrients for growth. In these situations growht can be restored by correcting the environmental problem.

In true dormancy plants will not grow even if they are given optimum environmental conditions. Dormancy sets in at the end of the growing season as the days get shorter and temperatures fall. The phytochrome system is a part of the control mechanism; low Pfr levels a decline in GA and rise in ABA are all associated whit the onset of dormancy.

To emerge from dormancy plants generally require a period of low temperature, weeks in the case of herbaceous perennials to months for many trees. After this cold requirement has been met the plant will grow again when environmental conditions become favourable.

In temperate and colder regions dormancy is associated with cold-hardening of above ground structures. While dormancy is a prerequisite for hardening it is not necessarily associated with it. The over-wintering structures of geophytes are protected by being underground and are not particularly cold hardy. Dormancy also occurs in some tropical plants as a means of survival during dry rather than cold seasons

Text 27

Taxonomy of Trees

Index

- What is a Tree?
- Taxonomy and Classification
- The Species Concert
- Why we use Latin names
- Rules for Naming Trees
- The Taxonomic Heirarchy

Lists of Trees

Descriptions of trees can be found by clicking on the appropriate index to the left. You should familiarize yourself with the material on this page, particularly the definition of "tree" and the taxonomic heirarchy, before using the lists.

Each index contains several subheadings, including: 1) lists of species? genera or families that have complete descriptions in the TreeWeb; and 2) lists of all species, genera or families in North America or the world.

If you are looking for a particular species, it may be fastest to use the Search tool, but be aware that spellings must be adding fuzzy searching later.

What is a Tree?

All animals that look like cart are in a single group, the family Felidae. Most plant that look like a cactus are in a single family, the Cactaceae. Is there a category that includes all the trees?

Surprisingly, the answer is no. There are trees in three of the four living divisions and several hundred living plant families. Modern trees don't even have a common ancestor. It seems that evolution has invented the tree many times during the 420 million years that plant have occupied the land. The word "tree" refers to a **life form**, a set of morphological features that we recognize as a tree.

We all recognize a tree when we see one. Perhaps the best person to ask "Is that a tree?" is a four-year-old child. Children know what trees are: they are great big tall plants. Despite this common-sense observation, botanists often struggle whit defining the term tree. One widely used definition specifies the size and shape of the organism:

"A **tree** is a perennial woody plant which at maturity is 13 ft or more in height, whit a single trunk at least 3 inches in diameter, unbranched for at least several feet above the ground, and having a more or less definite crown." (Little 1979).

This is a rather complex definition for something that most of us recognize instantly. It is probably just as important to recognize that not all large plants are trees. A yucca, with its tall blooming stalk, does not fit our definition of a tree, because it is not perennial (at least the tall part ins't perennial). Many authors also state that a tree produces secondary growth from a lateral meristem, the vascular cambium. However, this excludes the palms and tree ferns, and our four-year old would certainly consider these plants to be trees. A wood scientist might have a more utilitarian view of a tree: a tree is a large plant that produces wood.

Regardless of what definition we use, the difference between a tree and a shrub is often a quantitative difference rather than a quantitative one. **Shrubs** are woody plants that are usually smaller than trees at maturity and have multiple stems with no clear main trunk. Many species that are usually shrubs occasionally reach the stature of a tree. **Climbers** are woody plants that use often plants (or structures) to support themselves. These include such familiar plants as grapes and Virginia creeper, as well as a huge number of tropical species. Climbers typically have narrow stems with poor mechanical support, and specialized structures (often modified stipules or branches) for grasping

onto other plants. Climbers are sometimes called lianas or vines, though most botanists prefer to restrict the use of the term "vine" to members of the Vitaceae. As with shrubs, some climbers occasionally become trees; figs are a good example.

Here at TreeWeb we take a approach to trees, including palms, tree ferns and other plants that some authors would not include under the definition "tree." This gives us an excuse to include more plants. Some of the plants in the TreeWeb are usually shrubs, but occasionally occur as trees, and thus fit our definition.

We should note in passing that the TreeWeb includes a few shrubs and climbers. These are mostly plants native to Kentucky, and are included in the species list for forestry courses.

Text 28

Taxonomy and Classification

Taxonomy is the science of classification of organisms. It attempts to describe the relationships among species. The most useful taxonomic systems are phylogenetic, meaning that they reflect evolutionary relationships among species.

Modern classification began with Carolus Linneaus (1707-1778), who devised a system to describe and classify plants using the number and arrangements of flower parts. The Linnaean system, and most which followed it, were artificial systems. Artifical systems are ways of grouping organisms by similar features, but not in a way that necessarily reflects evolutionary, or phylogenetic, relationships. Artificial systems are useful for identifying organisms, but they may obscure important evolutionary relationships.

We are in a period of profound change in our understanding of taxonomic relationships because of two important advances in biology, cladistics and molecular biology. These two developments are causing a reevaluation of every level of the taxonomic heirarchy, and allowing scientists to develop phylogenetic classifications. Far from being a stully, arcane discipline, taxonomy is an exciting science at the frontiers of biology.

Phylogenetic relationships are difficult to analyze. Trees have left a sparse fossil record, with many important "missing links." Living tree species may closely resemble one another even if they are closely related. Many tree species hybridize easily. Any phylogenetic scheme for the classification of trees is subject to change as we learn more about molecular relationships and the fossil record.

For most purposes, the family, and species level are the most useful. Higher taxa, especially orders, are subject to considerable change as we learn

more. The lower taxa, (family, genus and species), change very little, and allow us to identify almost all trees.

For a more complete discussion of taxonomy, systematics and classification, see the Phylogenetic Systematics page at UC Berkeley.

Text 29

The Species Concept

The species is the fundamental unit of classification. As originally defined by the English cleric and biologist Jonn Ray (1627-1705), a species is a group of individuals which can breed with one another and produce progeny that are still of that species. Though this definition is somewhat circular, it was widely used for over 200 years. The species concert appeals to our common sense, for it is often easy to recognize species in the field. A cucumber-tree looks similar to an umbrella magnolia, but these trees are distinct enough that most people can easily recognize that they are separate species. Cucumber-trees always produce progeny that look like cucumber-trees, not like umbrella magnolias. Humans are obviously related to apes, yet just as obviously are a distinct species, and produce offspring that are recognizably human.

Ray's original definition was not precise enough for modern biology. The evolutionary biologist Ernst Mayr defined species in more modern terms: "Species are groups of actually or potentially interbreeding natural populations which are reproductively isolated from other such groups." The most familiar example of the species concert is the horse, the donkey and the mule: horse and donkey are separate species, and can only produce sterile progeny, thê mule.

Thing are not that simple when we consider tree species. If we wander through a forest in Central Kentucky, we will see dozens of species of oak. There are Shumard, pin, scarlet, red and black oaks, among the red oak group. But many trees cannot be assigned clearly to one species: are they Shumard, pin or scarlet, or are they something new? The problem may not be our ability to recognize species. Rather, the problem lies in the trees themselves: oaks hybridize easily, and produce fertile offspring. In a forest of many species of oaks, it may not be possible to assign more that 60% to a given species, the remainder being hybrids whose parents are not known. These combinations of two or more species are referred to as interspecific hybrids.

Interspecific hybrids are common in many tree genera. Some genera, such as Fraxinus do not appear to hybridize readily. The extent of hybridization in many genera is not well known, especially among tropical trees. At higher levels of classification, hybridization is rare, so that we rarely see intergeneric hybrids in nature.

A precise definition of species is not nearly as important as an understanding of the species concert. Species do hybridize in nature, and the

boundaries between some species are blurred. It is still true, however, that species are often real, distinct groups, with recognizable characteristics that separate them from other species.

Here is a definition of species which is loose enough for use in considering trees, but still retains the essence of the species concert:"A **species** is a group of organisms which resemble one another closely enough to suggest that they have common parantage and produce offspring."

You probably notice that this definition is very similar to the original definition of Ray. It is considerably looser than Mayr's definition, but it allows us to retain the essential useful feature of the species concert: that we can usually recognize species in nature.

Text 30

Why We Use Latin Names

Carolus Linnaeus (1707-1778) is regarded as the "father of taxonomy." His goal was to place organisms in a "natural" classification that revealed the Divine Order of God's Creation. His classification system was based strictly on the numbers and arrangement of saxual organs on a plant. Though we have largely discarded this strict sexual system, Linnaeus' use of heirarchy and binominal nomenclature has been his great legacy.

Like most scholars of his era, Linnaeus described organisms in Latin, using a string of words (a polynomial) like this: *Quercus foliis lanceolatis integerrimis glabris* (oak with spear-shaped, hairless leaves with entire margins) for willow oak. This widely used system was precise but very difficult to use. Imagine trying to memorize the names of even a few species! In the margins of his books, Linnaeus gave an abbreviated two-word description. Willow oak was abbreviated *Quercus phellos*. These short descriptions, known as **binomials** were quickly adopted by taxonomists because they were easier to remember. Binominal nomenclature is now our standard system for naming organisms, including trees.

Why not simply use common names? Willow oak is easier to remember than *Quercus phellos*, so why bother with the Latin? The main advantage of Latin names is universality: while common names may vary from place to place, Latin names remain fixed.

The same tree may have mare than one common name. For example, if we asked an Englishman and a Canadian to show us a sycamore, the Englishman would take us to tree in the genus *Acer* while Canadian would take us to a tree in the genus Platanus. Each is using the correct local name for the tree. The problem is compounded when people use different languages for the same tree. In Canada, Platanus may be called sycamore by an English speaker, and platane by a French speaker.

The name common may refer to unrelated species. In Canada and the northern US, poplar refers to a species of Populus, in the Salicaceae, while in the southern US, poplar refers to *Liriodendron tulipifera* in the Magnoliaceae.

Trees, especially those that are culturally important, may have common names, even in the same region. For example, *Amelanchier canadensis* has the following common names in the Appalachians of the United States: serviceberry, juneberry, shadbush, sarvis, shad, shadblow.

As the following table shows, common names can also be misleading, suggesting a close relationship where none exists. True cedars, such as Cedar of Lebanon, are in the genus *Cedrus*. There are no true cedars native to the Americas, but the term cedar has been applied to many tree species. The Latin names, espacially when used in conjunction whit the family name, indicate the relationships among species.

Will the Real Cedar Please Stand Up?

Common name	Latin name	Family
Eastern redcedar	*Juniperus virginiana*	Cupressaceae
Western redcedar	*Thuja plicata*	Cupressaceae
Northern whitecedar	*Thuja occidentalis*	Cupressaceae
Atlantic white-cedar	*Chamaecyparis thyoides*	Cupressaceae
Port-Orford-cedar	*Chamaecyparis lawsoniana*	Cupressaceae
Incense-cedar	*Calocedrus decurrens*	Cupressaceae
Arizona cypress	*Cupressus arizonica*	Cupressaceae
baldcypress	*Taxodium distichum*	Cupressaceae

Text 31

Rules For Naming Trees

Latin names would not be useful for describing trees without some system for their use. Botanists have agreed to a set of rules governing the naming of plants. The International Code of Botanical Nomenclature is the official rule book for the use of Latin names. The web is to the 1993 version of the code, which is revised periodically. (The botanical code is independent of the zoological code; while the botanical code prevents two species from having the same Latin name, it is possible for a plant and a animal to have the same Latin name; the genus Cecropia refers to s tropical tree and a common moth).

Only a few of the rules in the code are essential to our discussion. Briefly, they are:

1. **Heirarchy**. The taxonomic system is heirarchical, and every plant has a name within each level of the heirarchy. See the next section for a description of the heirarchy as applied to tree species.

2. **Grammatical endings.** Each level of the heirarchy above the genus level, and below the kingdom level, has a specific word ending. For our purposes, the important ones are the family ending-aceae (e.g. Fagaceae, Aceraceae) and the order ending-ales (Sapindales, Magnoliales).

3. **Type specimens**. Botanical names refer to specific plants. Because there is a good deal of variation in plants, it is essential that there be a set of preserved herbarium specimens to which botanists can refer. When an author publishes a proposed name for a newly discovered plant, a carefully prepared specimen, known as the type specimen, must be deposited in a recognized herbarium.

4. Valid publication. In order to establish a proper botanical name, the author must publish a paper describing the.

Text 32

The Taxonomic Heirarchy

Organisms are classified in a heirarchical scheme. The fundamental unit of classification is the species. Similar species are grouped into genera, genera into families and so on. The chart below shows the complete taxonomic description of two trees, Eastern white pine and Northern red oak.

For our purposes, the family, genus and species are the most useful levels in the heirarchy. Orders are being constantly revised, and there is considerable disagreement among taxonomists about the assignment of families to orders.

Contents

I. Reading in Class

Text 1. Cells 3
Text 2. Parts of the Cell 4
Text 3. The Chemical Elements of a Plant 6
Text 4. The Plant Cell 9
Text 5. The Nucleus is 10
Text 6. Respiration 11
Text 7. Photocynthesis 12
Text 8. Green Plants Capture the Energy of Sunlight 12
Text 9. Transpiratio 13
Text 10. Taxonomy 14
Text 11. Flowering Plants 15
Text 12. Breathing Plants 17
Text 13. The Seed 18
Text 14. The Life of the Plant. Seed and Germination 19
Text 15. The Root 21
Text 16. The Stem 23
Text 17. The Leaf. 25
Text 18. The Flower 26
Text 19. The Studying the Main Parts of a Flower 28
Text 20. Pollination 29
Text 21. After Fertilization 30
Text 22. Springwood and Summerwood 31
Text 23. Sapwood and Geartwood 32
Text 24. Ecological Factors 33
Text 25. The Nature of Soil Organic Matter 34
Text 26. Soil – a Medium for Plant Growth 36

II. Reading at Home

1. Translate the Texts in Writing 38
Text 1. Do you Know 38
Text 2. Golden Glow of the lesser Celandine 38
Text 3. Lesser celandine 39
Text 4. The Golden Weed in the Green Meadow 41
Text 5. Bulbous Buttercup 42
Text 6. The Woodland Ballerina 42
Text 7. It Turns Toward the Sun 43
Text 8. Tulip 44
Text 9. Iris. 44
Text 10. Poppies.. 45
Text 11. Madonna Lily 46

Text 12. Wallflowers 46
Text 13. It's Azalea time at Cypress Gardens 47
Text 14. The Birch and Other Trees 48
Text 15. Gymnosperms-Class Gymnospermal The Pine 49
Text 16. Horse-Chestnut tree 50
2. Sum up the Information of the Texts in Writing 51
Text 17. History from trees 51
Text 18. The wonderful storehouse 52
Text 19. Releigh's Plant 53
Text 20. Learning the language spoken by Plants 54
3. Choose any Text you Like, Translate it or Sum up the Information of it
Text 21. Theophrastus 57
Text 22. Botanical Taxonomy-a Historical Summary.. 57
Text 23. Seeds and Germination 58
Text 24. Flowering 59
Text 25. Fruit and Seed Development 60
Text 26. Dormancy 61
Text 27. Taxonomy of Trees 61
Text 28. Taxonomy and Classification 63
Text 29. The Species Concept 64
Text 30, Why We Use Latin Names 65
Text 31. Rules For Naming Trees 66
Text 32. The Taxonomic Heirarchy 67

Лариса Ивановна Сологуб

BOTANY IN ENGLISH

Обязательный материал для чтения на занятиях и дома

Учебное пособие

Печатается в авторской редакции

Компьютерная верстка, макет Н.П.Баринова

ЛР. № 020316 от 04.12.96. Подписано в печать 23.05. 2001. Формат 60x84/16.
Бумага офсетная. Усл. печ. л. 4,2, уч.-изд. л.4,5. Тираж 150 экз. Заказ № €ki
Издательство «Самарский университет», 443011,
г. Самара, ул. Акад. Павлова, 1
УОП СамГУ, ПЛД № 67-43 от 19.02.98.