

**REPUBLIC OF UZBEKISTAN**  
**MINISTRY OF HIGHER AND SECONDARY SPECIAL EDUCATION**



**TERMIZ STATE UNIVERSITY**  
**DEPARTMENT OF BOTANY**

# **BOTANY**

**(high plants)**

**SUBJECT'S**

**PRACTICAL EXERCISES**



Termiz-2022

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(high plants)

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This methodological instruction on PRACTICAL COURSES in the science of higher plants is compiled on the basis of the curriculum of the biology education of higher educational institutions. In the instruction manual, practical work on the science of higher plants is given, and photos and tables are provided for each work. The methodological instruction is recommended as an instruction for students of the biology education department of the Higher Educational Institution.

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## FOREWORD

The creation of the Law "On Education" and the "National Program of Personnel Training" laid the foundation for solving a number of problems in the field of education and their radical reform, as well as the training of highly qualified personnel with high moral and ethical standards. It was also recognized that in the formation of the new system and content of higher education, the need for advanced pedagogical technologies of education, creation of modern educational methodological complexes and didactic provision of the educational process was also recognized.

Botany course plays an important role in training biology specialists. In this way, by studying the different parts of the world of plants - our natural resources, comparing their systematic signs, studying their taxonomic units, as well as forming knowledge about complex interactions and connections in nature.

During the laboratory classes on plant systematics, students will get acquainted with representatives of the most important systematic groups of bottom and high plants, study their structure, distribution and importance.

This manual is aimed at independent performance of work, thinking, drawing conclusions and recovery of knowledge during laboratory training.

The teacher should teach students how to choose local materials and use identifiers, especially when identifying species of closed seed or flowering plants.

During the following decades, the "PRACTICAL TRAINING from the course of botany" study guide was not created, and according to the new program that is currently being used in practice, there are many changes in the classification of the world of plants, especially in the part of higher plants. Therefore, the creation of training manuals that meet the requirements of the new program is one of the urgent issues of our day.

## PRACTICAL EXERCISE 1

**Topic: Acquaintance with taxonomic units and categories in the systematics of higher plants. Rules for reading the Latin names of plants. Algae or moss section (Bryophyta). The structure of ordinary kakku linen.**

**( 2 hours)**

**Necessary materials.** Information about the schematic structure and opinions of scientists based on the study of fossils. Internet information and scientific books related to the topic.

### Rules for reading the Latin names of plants

The Latin language is the worldwide scientific terminological language, widely used not only in biological sciences, but also in various other natural sciences. Therefore, it is necessary for university students studying biology to be able to read the Latin names of plants correctly and to remember the Latin names of the main natural and cultivated plants. Taking this into account, we thought it would be appropriate to provide some information on the correct reading and writing of the Latin names of plants below.

#### LATIN ALPHABET

<b>PRINTED LETTERS</b>	<b>WRITTEN LETTERS</b>	<b>NAME OF LETTERS</b>
A A	<i>A A</i>	A
B B	<i>B B</i>	BE
C C	<i>C C</i>	SE
D D	<i>D D</i>	DE
E E	<i>E E</i>	E
F F	<i>F F</i>	EF
G G	<i>G G</i>	JE
H H	<i>H H</i>	EYCH
I I	<i>I I</i>	I
J J	<i>J J</i>	IOT
K K	<i>K K</i>	KA
L L	<i>L L</i>	EL
M M	<i>M M</i>	EM
N N	<i>N N</i>	EN
O O	<i>O O</i>	O
P P	<i>P P</i>	PE
Q Q	<i>Q Q</i>	KYU
R R	<i>R R</i>	ER
S S	<i>S S</i>	ES
T T	<i>T T</i>	TE
U U	<i>U U</i>	U

V V	V V	VE
W W	W W	DUBL-VE
X X	X X	IKS
Y Y	Y Y	IGREK
Z Z	Z Z	ZET

A letter or unit	Pronunciation	In what cases it occurs	An example
A	A	In many cases	Agropyron-agropiron
ae	E	In many cases	Peonia- peonia
	Ae	In this case, two dots are placed over the letter "ye".	Aenlus-aenlus
V	B	Always	Beta- beta
S	S	E, I, y, ae, oe – before	Cerasus-tseraszus
	K	In other cases	Communis-kommunis
ch	X	In all cases	Corchorus-korchorus
D	D	In all cases	Daucus-daukus
E	E	In all cases	Dens-dens
F	F	In all cases	Fagopyrum-fagopirum
G	G	In all cases	Fragaria-fragaria
H	X or G –soft	In many cases	Humulus-xumulus Hordeum-gordeum
	unreadable	Rh, gh, th- if it comes together	Rheum-reum Theobroma-teobroma
I	I	A consonant at the beginning of a word. Then	Glycine-glitsine
	Y	After a vowel	Dioica-dioyka
J	Y	In most cases	Juniperus-yuniperus
K	K	In all cases	Kochia-koxia
L	L	In all cases	Salsola-salsola
M	M	In all cases	Malva-malva
N	N	In all cases	Prunus-prunus
O	O	In most cases	Trifolium-trifolium
Oe	E	In most cases	Oenothera-enotera
	Oe	In such cases, two dots are placed over "e".	Aloe-aloe
P	P	In most cases	Pyrus-pirus
Ph	F	In all cases	Phacelia-fatselia
Q		Only once. Used.	
Qu	KV	In all cases	Equisetum-ekvizetum
R	R	In all cases	Sorbus-sorbus
S	S	In most cases	Ribes-ribes
	Z	Between two vowels and together with m,n,r.	Rosa-roza
Sch	Sx	In all cases	Schiandra-sxizandra
T	T	In all cases	Triticum-tritikum
Ti	Si	Before vowels, not after s,x,t.	Nicotiana-nikotsiana

U	U	In most cases	Rubus-rubus
	V	q- after and when aqu comes together.	Aquilegia-akvilegia
		Sometimes before a vowel before su-vowel	Suaeda-sveda
V,W	V	In all cases	Vicia-vitsia
X	Ke	In all cases	Carex-kareks
Y	I	In all cases	Oryza-oriza
Z	Z	In most cases	Zea-zea

**Algae or moss section (Bryophyta). Class Bryophyta. The structure of ordinary kakku linen.**

Necessary materials. Living mosses Polytrichum, Funaria, or Sphagnum, as well as herbarium of the above mosses, cross-sections of stems and leaves, male and female gametophytes, and longitudinal sections of sporogonia .

**GENERAL CONCEPT:** In the development cycle of algae, like other higher plants, there are two stages (phases) - gametophyte (n) and sporophyte (2n). However, it differs from other higher plants in that the gametophyte prevails in them. That is why algae are considered to have an independent, separate direction in evolution.

The gametophyte is stem-like and divided into cauloid and phylloid or stem and leafy thallus (conventionally called "stem" and "leaf"). There is no root. Their function is performed by rhizoids (single or multi-celled).

In the department of lichens, the sporophyte, called the sporogone, depends on the gametophyte, and it ends with a foot and its tip with a spherical or cylindrical capsule. Spores are formed inside it.

The sporogon is firmly attached to the gametophyte, and receives water and nutrients from it that are important for life. The total body size of gametophyte and sporogone can be up to 60 cm.

The department has 25,000 species and is divided into several classes.

**1. Anthocerotoid algae (*Anthocerotopsida*).**

**2. Liver-like algae (*Marchantiopsida*).**

**3. Leafy or true lichens (*Bryophyta*).**

The class of leguminous bryophytes is further divided into 3 classes - Andreaiales (*Andreaidae*), Sphagnumales (*Sphagnidae*) and green mosskiba (Bryidae).

This ancestry includes several tribes. One of them is the tribe Polytrichumnamo (Polytrichales). One of the representatives of the tribe is Polytrichum commune.

## **TASKS:**

1. For observation, 2-3 types of well-differentiated representatives of moss distributed in different environmental conditions are taken (funaria and peat moss or kakku flax).
2. Compare and describe the types in detail and draw their pictures. Prepared or permanent preparations are used for this.
3. Describe the development cycle of one of the studied species (schematic).

## **PROCEDURE:**

a) We will consider the characteristic features of algae on the example of Kakku flax. This plant grows mainly in forests, swamps and marshes, forming thick grass. Its upright stem reaches 20-40 cm, does not branch, densely covered with pointed, rough, hard leaves. The leaves are arranged in a row, forming a sheath that surrounds the stem. The lowermost leafless part of the stem turns into a rhizome under the soil, from which multicellular rhizoids are formed. The internal structure of the stem has a somewhat complex structure, and consists of the outer epidermis, the bark and the central part of the tube bundles. They correspond to phloem and xylem.

Kakku flax is a dioecious plant. Their organs are antheridia and archegonia, and they are formed at the tip of the stem. Antheridium is located between serbar, reddish or yellowish leaves. The wall of the antheridium consists of several spermogenic cells in one layer. Each spermogenic cell produces two-celled spermatozoa. Among the antheridia, there are special paraphyses, which look like threads and expand at the top, turning into plates. Fertilization is carried out with the help of water. A sporophytic offspring, a sporogony, is formed from a fertilized egg cell. Ripe sporogony consists of two parts - lobe and band. The upper side of the capsule is surrounded by a hairy cap growing from the ventral wall of the archegonium. The cyst, in turn, is divided into a slightly expanded base and a cap that closes the cavity of the cyst. A sac-like sporangium is located in the cavity of the pod. After the spores formed in the sporangium become ready, the cyst opens. Before the capsule is opened, first the cap falls off, and then the cap is opened. At this time, the epiphragm and several short teeth (peristomes) with rounded ends are located around it. There are holes between the epiphragm and the teeth, from which the spores are scattered. Peristome helps dispersal of spores. After the spores fall into favorable conditions, they grow into protonema fibers, and buds form in them. Buds gradually grow and turn into gametophytes, i.e. stem leafy mosses. This plant is widespread in the temperate regions of the Northern Hemisphere.

In the anatomical structure of the stems and leaves of white (sphagnum) mosses, it is seen that there are 2 types of cells. The first type of cells are longer and have chlorophyll granules. Their ends connect to each other and form a net.



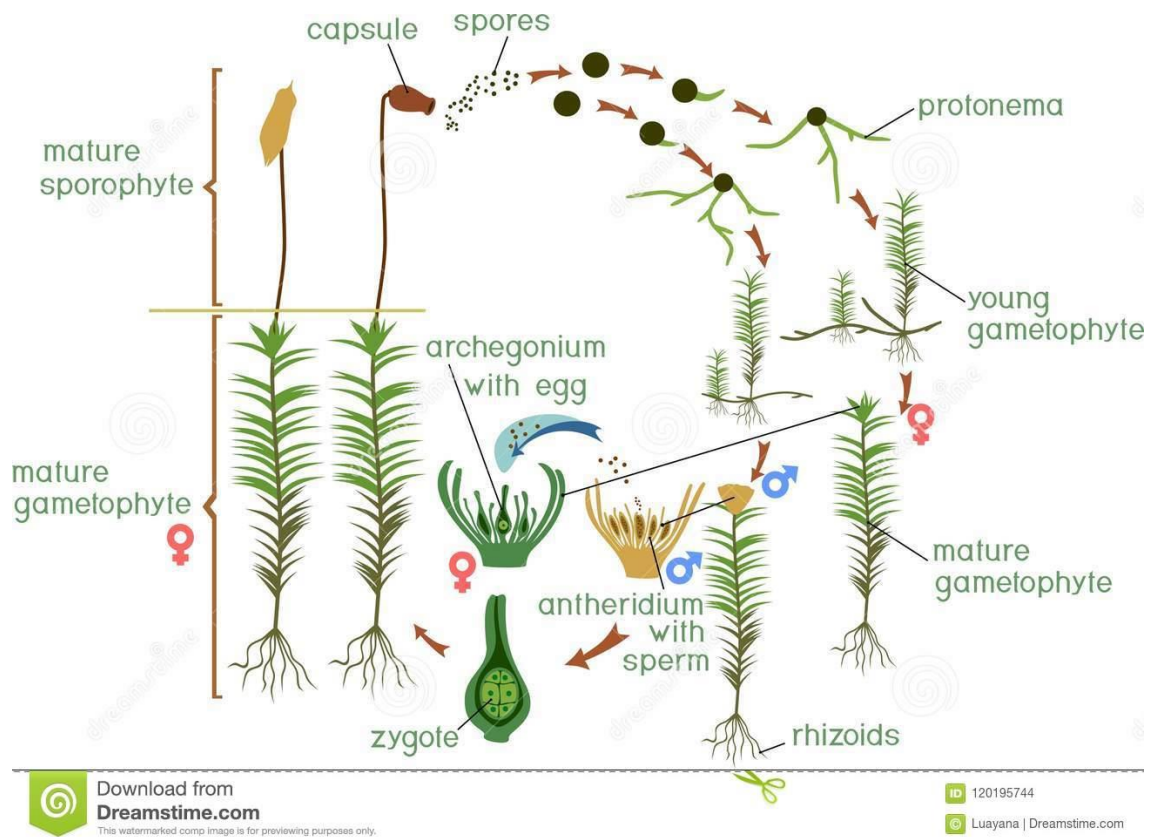
The second type is crystal clear and filled with water located in the mesh. Such cells are considered hyaline (dead) cells and do not have chlorophyll granules.

In the upper part of the stem, reproductive organs - antheridium (between the branches) and archegonium (at the end of the stem) are made. The antheridium has an oval or spherical shape, in which two-lobed spermatozoa occur. An egg cell develops in an archegonium. Fertilization occurs as a result of spermatozoa reaching the egg cell with the help of water. A fertilized egg develops from a cell into a sporangium. The sporangium consists of two parts - a pod and a short band. As a result of the rupture of the wall of the sporogony, the spores spread out and fall to the ground. At first, protonema and rhizoids grow from the spore, and then it turns into a sphagnum plant.

The structure of the sporogone, as well as the structure of the vegetative organs of the gametophyte, are mainly taken into account in the identification of mosses. That is why mosses with spores are collected when preparing herbariums.



1-picture. General view *Polytrichum commune* Hedw.



2-picture. *Polytrichum commune* Hedw. reproductive cycle

### REINFORCEMENT QUESTIONS:

1. What is the structure of the representatives of the hyacinth section, the uniqueness of their life cycle, and their closeness to algae?
2. Why is the department of bryophytes considered to have a separate direction in the evolution of plants?
3. Sphagnum moss is considered primitive based on its structure?

### PRACTICAL EXERCISE 2

**Topic: Plant department Plauntoifa (Lycopodiophyta).**

**(Study of common plaun and common selaginella)**

**( 2 hours)**

**Necessary materials:** herbarium of sedum plaun - *Lycopodium clavatum* and *Selaginella selaginoides* from the selaginella family, and permanent micropreparations prepared from longitudinal sections of spore-bearing spikes of these plauns.

### GENERAL CONCEPT:

The sporophyte of plants is characterized by the presence of small, sometimes grain-like closely spaced leaves (microphylls). Representatives of this

section have a well-formed root, stem, and are herbaceous or woody. For branching of stem and root. The department is mainly divided into two classes.

1. Plauniformes (*Lycopodiopsida*) and Polushniciformes (*Isoetopsida*). The representatives of the first class mainly produce spores of the same type, while the spores of the second class produce large and small spores of various types, therefore, their gametophytes are of different sexes.

### **TASKS:**

1. Morphological interpretation of a specific species and drawing of its structure (leaf, sporophyll spike axis, sporophylls with sporangia and spore).
2. Changes observed from the germination of Plaun and Selaginella spores to the formation of the sporophyte and its spore-storing spike, schematic representation of their life cycles, and their comparison.

### **PROCEDURE:**

a) We will consider the specific features of plauns on the example of a flint plaun. This plant is an evergreen 2-3 meter plant with a horizontal branching branch and a vertical branching branch, which is widely distributed in the coniferous forest zone. The stem is round, the leaves are arranged in a row. It is observed that the leaf plate is elongated and finished with a long thin fiber. Then we will get acquainted with the structure and location of the spike that stores spores. There are 2 spikes on a long leg, and in some cases 3-5 spikes. The spike is cylindrical and consists of an axis and sporophylls densely located in it. Sporophylls differ from vegetative leaves in terms of shape and structure. It has a coin-shaped triangular shape, with a slightly pointed tip. After observation, a part of the spikelet, sporophyll with sporangia is drawn. The structure of the spike can be observed through the available permanent drug. After that, the spore structure is studied. For this, the sporangium is crushed, the spores in it are poured into the glass of the object, and it is observed and drawn under a microscope. Pay attention to the fact that the spores are all uniform and small.

b) In the same order, observe a representative of a certain species of different spore plants.

c) Identify the main differences and similarities between the representatives of the two classes and show them in the cycle of development.

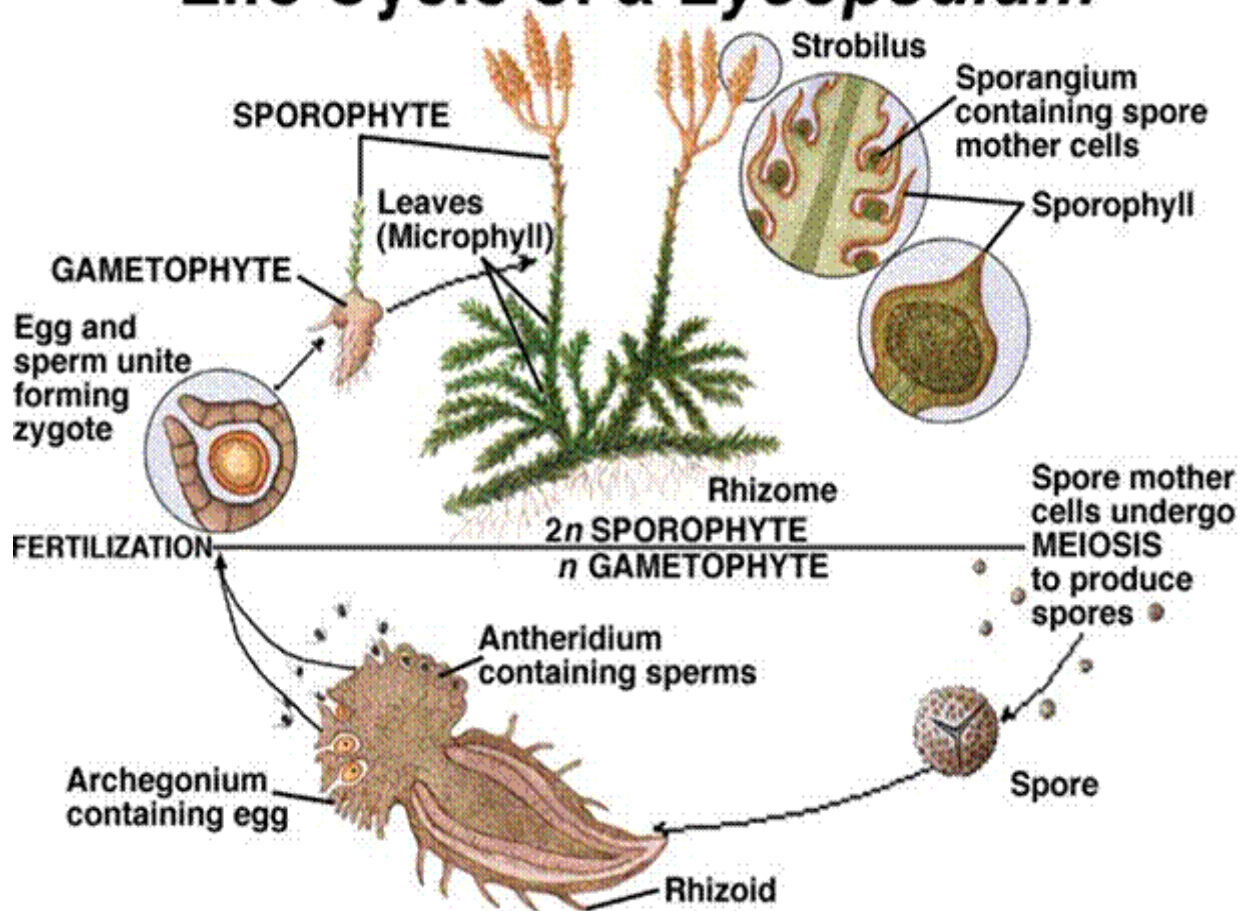
**Origin:** Plauns are descended from Rhinians. They developed from the Devonian period of the Paleozoic era, and their remains are important in the formation of coal deposits. Plants are microphyllous (small-leaved) plants. Plauns are an evolutionary dead end.

**Significance:** Plauns are not a good food for livestock, but their spores are used to make baby diapers, and in metallurgy, they are used for sandblasting molds.



3-picture. General view *Lycopodium clavatum* L.

## Life Cycle of a *Lycopodium*



4-picture. *Lycopodium clavatum* L. reproductive cycle



**5-picture. General view *Isoetopsida lacustris* L.**



**6-picture. Selaginella as house flower plant**

**Task:**

A question-and-answer session will be held on the topic.

**REINFORCEMENT QUESTIONS:**

1. What is the life cycle of a flounder?
2. What is the structure of spore storage spikes?
3. What are the characteristics of the representatives of the class of plauniformes and polypsuniformes that differ from each other?
4. What is the evolutionary significance of having different types of spores?

**PRACTICAL EXERCISE 3**

**Topic: Equisetophyta plant division.**

**The structure of the field shear joint.**

**(2 hours).**

**Materials required:** Live and herbarium specimens of *Equisetum arvense* or meadow horsetail (*E. pratenses*). Their spore-preserving spikes preserved in alcohol or dried, as well as permanent micropreparations prepared from a longitudinal section of a spore spike.

**GENERAL CONCEPT:**

Distinctive features of the sporophyte of the rhododendrons are the arrangement of the side branches of the stem in the form of a tuft. The leaves are also arranged in a round shape, and the joints and joints are clearly visible. The leaves are small (microphyllia) reduced, have one medium vein. Sporangia are located in sporophylls and collected in spikes.

In the Devonian and Paleozoic eras, many representatives of this section were tree-like and widespread. Currently, this section has only one class of Equisetum, and this class has only one genus Equisetum. This category has more than 30 species, all of which are herbaceous plants.

**TASKS:**

1. Complete representation of one species of the category (morphological and systematic characters)
2. Studying the structure of the spore-bearing spike (stem), drawing and labeling them.
3. Observing the spores of field sedge under a microscope.
4. Schematic representation of the development (life) cycle of four joints.

## **PROCEDURE:**

As an example, we can take *Equisetum arvense*, a common and easy-to-identify species in our country. The herbarium sample is mainly collected during the period of spore formation.

The sporophyte of field sedge is a perennial, rhizome, herbaceous plant with rhizome nodules. They are the size of walnuts and store starch. Basically, they produce 2 types of stems - early spring spore-forming stems that dry up after the spores mature, and late spring (summer) ones that do not produce spores, they are called summer vegetative stems. During the growing season, they accumulate nutrients in the root stem as a result of photosynthesis.

Spore-bearing stem is brown, unbranched without chlorophyll, 15-30 cm tall. The joints are covered with deformed leaf sheaths. The tip of the stem ends with a spike that produces spores. Vegetative (summer, sterile) varieties are green, branched, the sheath is cylindrical, and the teeth are lanceolate-shaped.

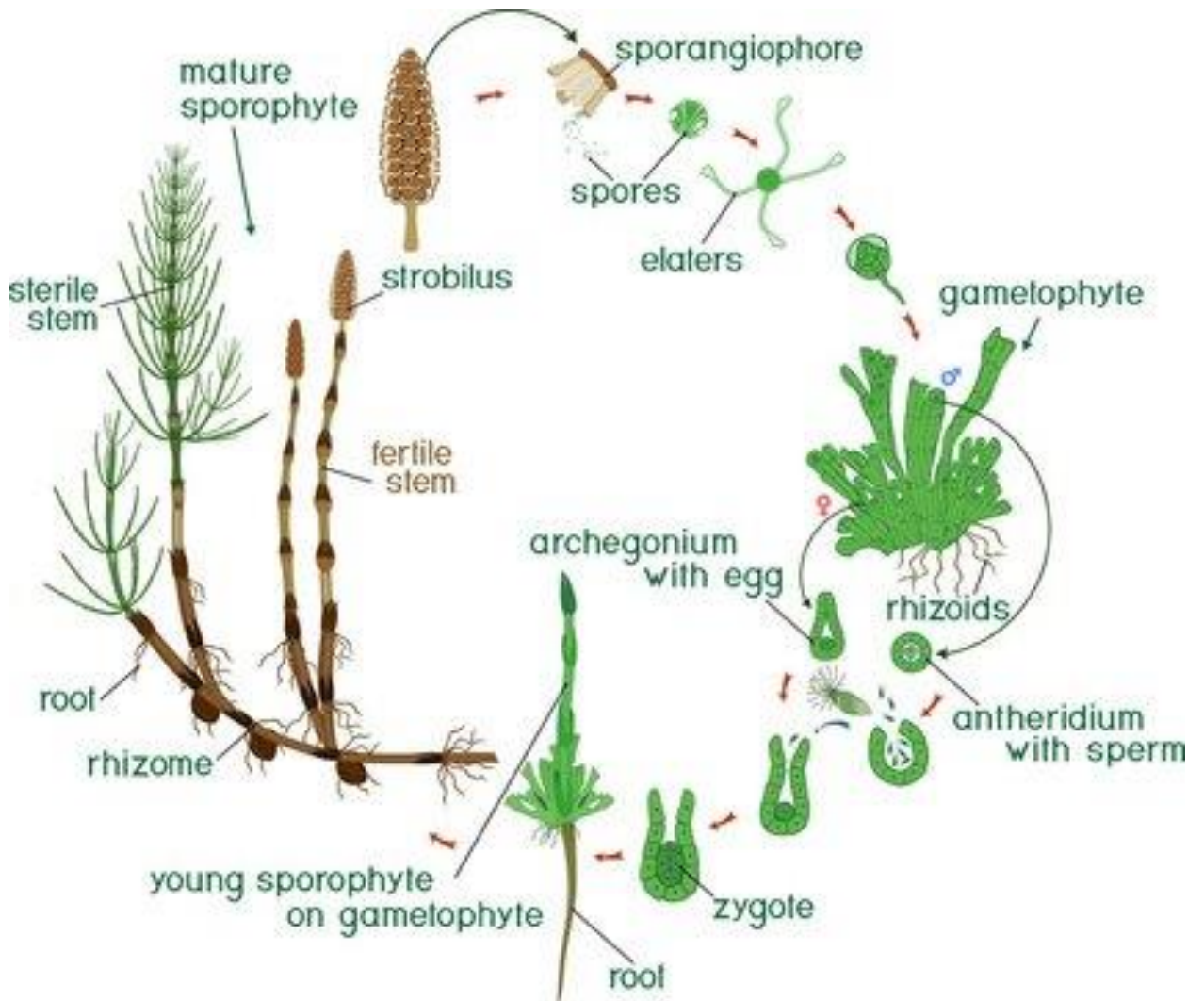
With the help of a microscope, a spike fixed in alcohol or with live spores is observed. The upper part of the spike is pointed. The spore-storing spikelet has a 6-sided shield attached to the arrow and a special foot, and sac-shaped sporangia located on its lower edge. A large number of spores are produced in sporangia.

Special preparations are used to study the structure of spores. To do this, the dried spike is tapped (shaken) on the glass of the product. A few uniform spores falling on the glass of the object are observed under a microscope without closing the cover glass (without dripping water).

The sporoderm consists of 3 layers, i.e. apart from the exine and intina, the outer layer is the perina, from which two spiral ribbons - elaterals - are formed during the maturation of the spores. If the spores are moistened and observed under a microscope, we can see that the elaterals are twisted under the influence of moisture. In general, as we know, elaterals ensure the dispersion of spores in swarms. Although the spores are uniform in appearance, some spores form a male gametophyte, and some form a female gametophyte. That's why elaterals are very important.



7-picture. General view *Equisetum arvense* L.



8-picture. *Equisetum arvense* L. reproductive cycle



**Task:** A question-and-answer session will be held on the subject.

**REINFORCEMENT QUESTIONS:**

1. Distinctive features of the branch of the four arthropods.
2. Explain the life cycle of the field cuttlefish.
3. The structure, difference, functions of generative and vegetative branches of rhizomes.
4. What is the structure of the gametophyte of field sedge?

**4 - PRACTICAL TRAINING**

**Topic: Plant division of *Polypodiophyta*.**

**The structure of floating *Salvinia* and wood warbler**

**(2 hours)**

**Necessary materials:** 1. Live or herbarium specimens of the male woodpecker (*Dryopteris filix-mas*), a drawing depicting the development cycle.

2. Floating salvinia (*Salvinia natans* L. ) herbarium, as well as permanent micropreparations prepared from cuttings of soridia.

**GENERAL CONCEPT:**

The distinctive features of this section are the large leaves (megaphyllia), the well-formed root system and the absence of spikes that store spores.

On the territory of Uzbekistan, only grass-like representatives of sedges can be found. The section has more than 10,000 species and is divided into three classes:

1. Ophioglossopsida.
2. Marattiopsida.
3. Polypodiopsida.

The class Polypodia, or true ferns, is divided into two tribes:

- 1) Polypodiana
- 2) Salviniyanamos

The sporangia of most extant cuttlefish have a thin shell and burst into rings. 64 spores are produced in sporangia. Some representatives of one class produce spores of the same type (male crickets), and some representatives produce different spores (large and small) (water crickets).

The stem of most representatives is short, the leaf is formed only from the upper side, and additional roots are formed from the lower side. And the sporangia

are located on the back of the assimilating leaves. Gametophyte growths usually consist of one layer of cells, and they are above ground, green in color.

In various spore-forming representatives, micro- and megasporangia are formed, each megasporangium produces 32 megaspores, but only one is viable. Each microsporangium produces 64 microspores.

Micro and megasporangia are located in contiguous sporocarpia, and spores grow inside the sporangia.

Reduction of gametophytes is observed in various spore-forming representatives. For example, the vegetative part of the male gametophyte has only two cells. And the female gametophyte is so small that part of it remains in the shell of the megaspore.

During the initial growth, the sporophyte-green female feeds on the gametophyte (*Salvinia*, *Marsilea*, etc.).

### **TASKS:**

1. Acquaintance with the herbarium of common species and living samples of sedges and comparison of their morphological features.
2. Complete examination of one species (*Venus hair* or male earwig), annotating and drawing.
3. View the cross-section of sori under a microscope and draw the parts of the leaf sori.
4. Schematic presentation of the life development of the same and different spore-forming cuttlefish.

### **PROCEDURE:**

Let's get acquainted with the structure of the male cuttlefish (*Dryopteris filix-mas*) on the sample comb. For this, the herbarium collected during the period of spore formation is used, and the vital form of the plant, the location of the rhizome, the shape, the morphological structure of the leaf; (location, shape of sori, presence or absence of indusium (covering veil), etc. are determined.

The sporophyte of the male sedge is a perennial, herbaceous plant, up to 1 m in height, with a thick, short black-brown rhizome underground. A bundle of green leaves emerges from the upper tip of the rhizome. The leaves are elongated elliptic, twice feather cut. In the back (lower) part of the leaf, along the central veins, there are bunches of sporangia-sori, which have covering indus on the upper side. Observed signs should be drawn.

Then, a preparation is prepared from the section of the sorus and observed under the large and small objects of the microscope. In order to observe the

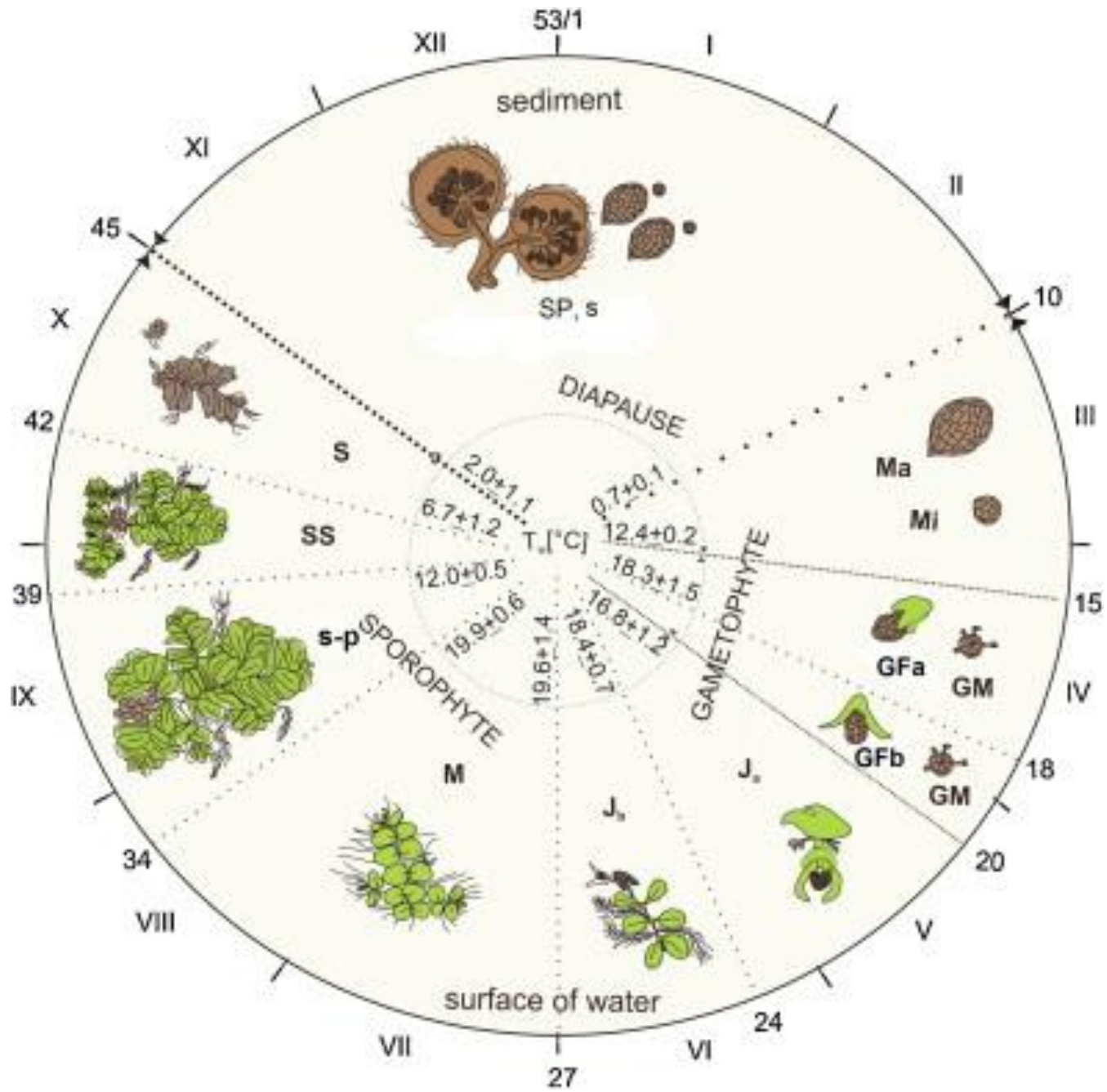
emergence of spores, a sporangium separated from the upper sori is placed on the glass of the object, and a drop of water is dropped and observed in a small lens.

When the spores fall into a favorable environment, outgrowths are formed from them (gametophyte). It is bisexual, green, in the form of a heart-shaped plate 4 mm in size, and in the part with archegonia and rhizoids, round antheridia are formed around the grooves.

Independently study the structure of various spore cuttings on the example of floating salvinia (*Salvinia natans*) and draw a cycle of development.



9-picture. General view *Salvinia natans* L.



10-picture. *Salvinia natans* L. reproductive cycle



11-picture. General view *Dryopteris filix-mas* (L.) Schott

**Task:**

A question-and-answer session will be held on the topic.

**REINFORCEMENT QUESTIONS:**

1. What is the difference between the representatives of the plant division of the genus *Kirqulok* and other modern high-spored plants?
2. What adaptations have occurred during evolution?
3. What is the structure of the gametophyte of the male centipede?
4. What are the characteristic features of the sporophyte and gametophyte structure of various spore-bearing fungi?

**PRACTICAL EXERCISE 5**

**Topic: Plant division of pine family (Pinophyta, Gymnospermae).**

**Studying the structure of common pine, ginkgo biloba, and sedum**

**(2 hours)**

**Necessary materials:** Eldar pine, Tuya, Biota, spruce and cypress dome branches, herbariums. Alcohol-fixed specimens of young pollinators and seed pods of the species. Various permanent micropreparations.

**GENERAL CONCEPT:**

Distinctive features of angiosperms are that the seed has a bud and the seed is formed from it. The seed is open in the fruit leaf, that's why they are called open-seeded plants. The seed gametophyte consists of endosperm and 2 archegonium.

The department is divided into several classes, among which representatives of the class of conifers or domes are extremely common.

We will get acquainted with the structure and development cycles of the common pine (*Pinus silvestris*) belonging to the pine family (Pinaceae) and junipers (*Juniperus*), which is a representative of the cypress family (Cupressaceae). The representatives of the cypress family consist of trees and shrubs with opposite or alternate leaves. The leaves are often lanceolate, sometimes needle-like, monoecious or dioecious plants. The seed capsule of seed pods merges with the covering capsule to form a dome-shaped shell, inside which there are 1-3 seed pods. Microsporophylls consist of a short thread and an expanded part with 3-6 microsporangia. Juniper domes are rhizomes, ball-like, with 1 to 10 seeds inside, produced in the second or third year.

**TASKS:**

1. A branch with male and female domes is introduced, the structure and parts of the domes are studied and drawn (in the example of eldar pine).

2. Explore the differences and similarities between eldar pine and juniper domes.

3. To be able to distinguish representatives of the class of domes on the basis of leaf structure and location on the stem.

### **PROCEDURE:**

1. A male dome is seen under a magnifying glass. A separate sporophyll is separated with a needle and viewed under a magnifying glass. It is determined what is on the underside of the sporophyll, what is the shape of the microsporangium.

Inside the sporangium are mother cells, as a result of their reduction division, tetrads are formed, and these tetrads turn into microspores. The growth of microspores in the male gametophyte begins in the microsporangium. At this time, the microspore cell divides into four cells in a row. Two of the four cells formed in this way (vegetative cells of the stem) die, one of the remaining two is a vegetative cell, and the other is an antherid cell. During the development of the male bud, two membranes - intina and exine - appear. At this time, the dust in the microsporangium is dispersed. After pollination, the male flower develops further in the seed bud in the second year. In this case, the pollen membrane is torn, the vegetative cell is elongated and forms a pollen tube. The micropyle cell of the nutcellus is divided into two: one of them, forming the antherid wall, is absorbed, and the second, the mother cell of the spermatozoa, divides again and gives two spermatozoa. Pine spermatozoa differ from the spermatozoa of previously studied types in the absence of hyvchins. They move to the front end of the dust tube.

2. Note what is in the axis of the female dome, how the macrosporophylls are located. Separate the individual macrosporophyll. Look at the top of it with a magnifying glass. At the base of the macrosporophyll there are two seed buds, microsporangium. The micropyle of the seed is facing towards the base of the dome. An immature seed has a covering membrane (integument) and nutcellus in the bud, and in terms of formation, it is similar to the formation of the sporangium wall. A single cell from the nutcellus becomes the mother cell of the macrospore.

It divides reductively, three of the four cells formed are absorbed, and one remains. This cell is a macrospore. Its growth starts from the macrosporangium. In this case, the macrospore divides many times, and a multicellular body - the female germ or endosperm - is formed.

Two archegone with one ovule in each of them are formed. After the sperm enters the archegone, the egg joins with the cell and the process of fertilization begins. A seed develops from a fertilized egg cell. Reserve nutrients are stored in the endosperm (seed coat). After fertilization, the dome grows and turns green. In autumn, the dome turns brown. A picture of a macrosporophyll with macrosporangia is drawn.

It is necessary to be able to distinguish the most common oleanders from each other depending on the dome and the leaf. In the study of pineapples, the following signs should be considered: evergreen or whether the leaf is shed in winter or not, whether the leaf is lanceolate or lanceolate, whether the tip of the leaf is sharp or obtuse, the shape of the cross section, the leaf is single on the branch or it is located in a bunch, attention is paid to how many leaves are on one branch. When studying the cuppa, the following should be considered (whether it is dry, dry, hanging or upright, its shape, length, whether the cover grains have come out, seeds, the shape of the leaf edge, whether it sheds or does not shed when harvested). pay attention



**12-picture. General view *Pinus sylvestris* L.**

### **REINFORCEMENT QUESTIONS:**

1. What are the characteristics of the open-seeded or spruce family from higher plants with spores?

2. Describe the life cycle of open-seeded plants (for example, a common pine or a spruce).

3. What is the structure of the male dome of domes?

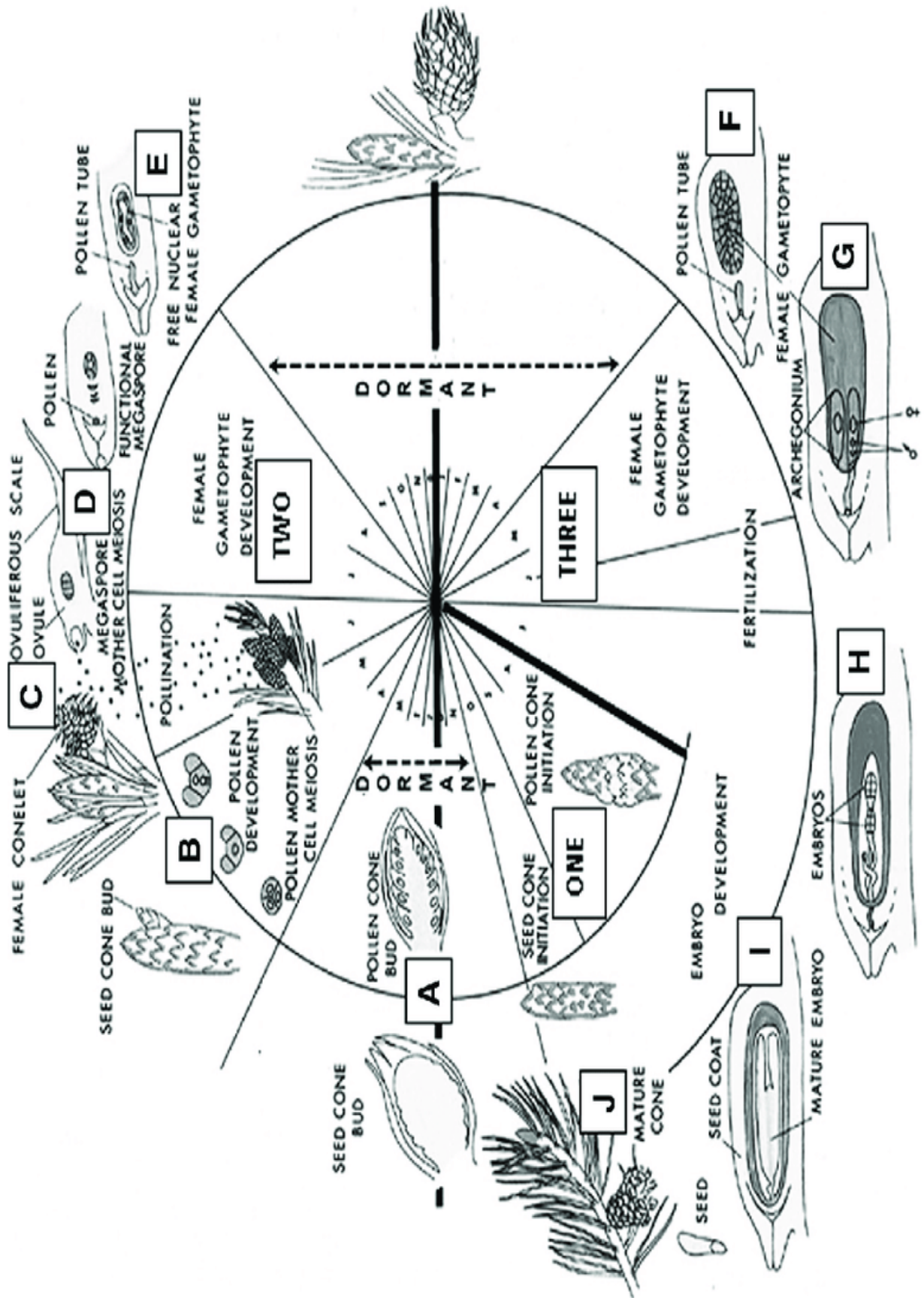
How is the male gametophyte formed?

4. Explain the structure of the seed dome in representatives of the class of domes?

5. How is a seed formed and what is its structure?

6. What types of firs are found in Uzbekistan and what are the differences between these types of firs?

7. What types of representatives of the cypress family do you know ?



13-picture. *Pinus sylvestris* L. reproductive cycle



## PRACTICAL EXERCISE 6

**Topic: Magnolia family (Magnoliophyta, Angiospermae) - a section of plants with flowers or closed seeds. Magnolia family (Magnoliaceae). The structure of magnolia**

**(2 hours)**

**Required materials:** Various permanent micropreparations. Herbariums, plant identifiers,

Pictures, tables, fictitious flowers, fruits, magnifier, tweezers, proporoval nina and others.

### **GENERAL CONCEPT:**

Angiosperms include 8 classes (ancestors), 128 tribes, 429 families, 10,000 genera, and about 190,000 species.

1. Magnolia family. This family has about 240 species belonging to 12 genera, trees or shrubs with leaves that are evergreen (USA) or deciduous (where they grow in Asia). It is grown as an ornamental tree in Uzbekistan. The flowers are large and fragrant. The structure of flowers, fruits and vegetative organs of magnolia is unique.

As the main representative of this family, let's get acquainted with the large-flowered Magnolia (*Magnolia grandiflora*).

Angiosperms are characterized by having seeds and fruits. In the sporophyte, the formation of a spore, a branch with a changed shape, leads to a flower. Microspores are formed in the anthers of the anther, and megaspores are formed from the spore inside the seed nodule. Male gametophyte - pollen consists of two cells. The female gametophyte has eight (8) cells. As a result of the sexual process, a seed with an endosperm is formed from the seed pod. A fruit is formed from the cotyledon and other parts of the flower.

Angiosperms are trees, shrubs, forbs, and grasses that are widespread in a variety of ecological environments. They are important in nature and human life. Almost all agricultural plants belong to this department. The section has 250,000 to 300,000 species and is divided into two classes (dicotyledons and monocotyledons).

A class of Dicotyledons or Magnolias. (Dicotyledones or Magnoliopsis). The characteristic features of this class are that their hairs are bilobed; well-developed main root; dividing the cambium layer in the bark; openness of tube connections; the flowers are 5-round type and the petals are often double-petalled. The class is divided into 8 classes.

Materials needed: Herbarium specimens of Magnolia. Flowers, fruits fixed in alcohol.

**TASKS:**

1. Vegetative and generative organs are studied using the magnolia herbarium.
2. Draw a picture of a leaf, flower and its parts, fruit, seeds.
3. Checked types are identified.

**PROCEDURE:**

If living materials are not enough, we use herbarium materials, and finally we get a complete picture of magnolia by looking at tables and pictures. We give a complete description of the magnolia plant.

Magnolia with large flowers is a tree up to 30 meters high. The leaves are large, light green on top, and brown hairy on the bottom. The leaves and bark contain essential oil glands. The flowers are bisexual, 10-25 cm long, the corolla is large, arranged in 3 rows, with 6-12 petals. They are usually white or pink. There are many farmers and sowers. It is pollinated by special beetles. The fruit is dry, 5-7 cm. Essential oil is obtained from leaves and young branches and flowers. Hushbuy is fragrant.

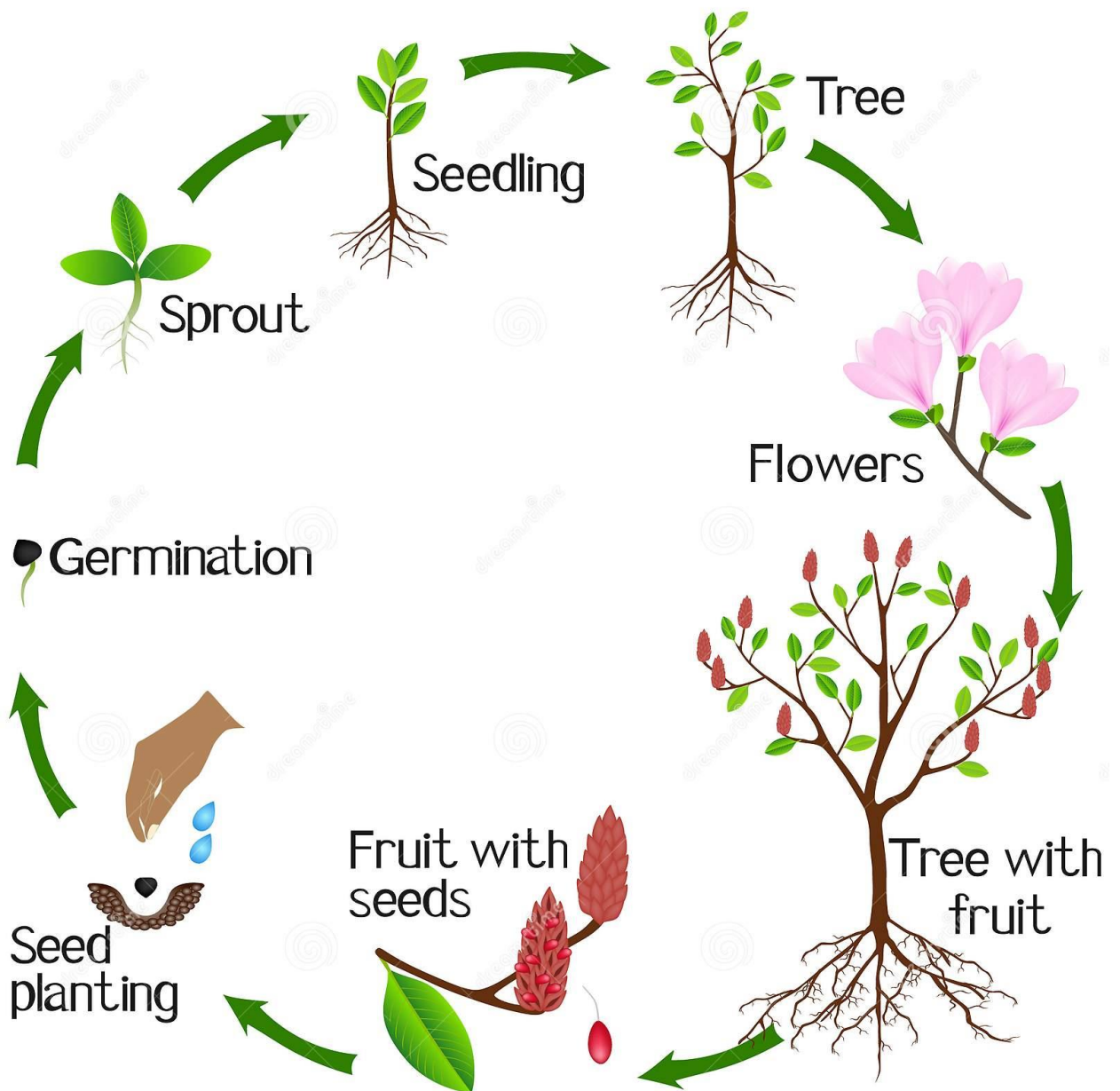
This family also includes the Tulip tree (*Liliodendron tulipifera*). Its height is 30-40 m. Its flower resembles a tulip flower, hence the name tulip tree. Both species are cultivated as ornamental trees in Uzbekistan. Compare large-flowered magnolia and tulip tree plants.



14-picture. General view of magnolia tree and structure of flowers



15-picture. The appearance of the tulip tree and the structure of its flowers



**16-picture .Life cycle of *Magnolia grandiflora* L.**

**REINFORCEMENT QUESTIONS:**

1. What plants do you know that belong to the magnolia family?
2. What is the flower structure of magnolia?
3. Which representatives of the magnolia family are planted as ornamental trees in Uzbekistan?

## PRACTICAL EXERCISE 7

**Topic: Magnoliaceae (Magnoliophyta, Angiospermae), a section of flowering or closed-seeded plants. Ranunculaceae family. Species included in the Red Book (2 hours)**

**Required materials:** Various permanent micropreparations. Herbariums, plant identifiers,

Pictures, tables, fictitious flowers, fruits, magnifier, tweezers, proporoval Nina and others.

### GENERAL CONCEPT:

The representatives of the Aiktovanodosh family are mainly perennial and annual herbs and have 66 genera and more than 2000 species. There are 25 genera and 202 species in Central Asia, and 20 genera and 107 species in Uzbekistan. The leaves are simple, cut to different levels, without a side. The categories are well distinguished from each other by the structure of the flower. For example, the flower of some species is simple, the number of flower organs is different and arranged in a spiral. (*Hepatica*, *Anemone*). The flower structure of some representatives of the genus is adapted to pollination by insects, while the inflorescences of the *Aconitum* species are zygomorphic, or the inflorescences of the *Thalictrum* species are reduced due to the adaptation to wind pollination. Many representatives of this family are widely used in medicine because they have strong alkaloids. Some representatives of the genus (*Delphinium*) are considered dye plants, while representatives of the sedana (*Nigella*) genus are widely used in the food industry.

Wild sedana (*Nigella integrifolia*) is an annual herb, 15-25 cm tall. Calyx leaves 5-8, two-lipped. The fruit is short and hairy. It blooms and gives seeds in April-May. It is found among crops and empty fields in hilly and mountain areas

The height of the seedling (*Nigella sativa*) is 20-75 cm, it blooms and seeds in May and June. It is grown as a spice plant in almost all regions of Uzbekistan.

Most of the plants belonging to the Isfarak (*Delphinium*) family are distributed in the temperate regions of the globe. There are 45 types of Central Asian flora. These are annual and perennial herbaceous plants. *Delphinium semiborbatum* is widely distributed in mountain and sub-mountain zones in Uzbekistan. Our people have known this plant since ancient times as a dyeing plant that gives valuable color.

160 species of *Aconitum* genus are distributed in the Northern Hemisphere, especially in mountainous regions. *Aconitum thalassicum* is a perennial rhizome herb. Height 60-150 cm. The leaves are finger-shaped. The flowers are monosymmetric and arranged in shingle-shaped clusters. 9 out of 11 species of this group distributed in the Commonwealth countries are found in Central Asia. All of

them are perennial herbs. Flower formula:  $Ca_5 Co_\infty A_\infty G_\infty$ . The fruit is multi-seeded. In Uzbekistan, the type of this species known as Turkestan insurance (*Adonis turkestanica*) is widespread on the soft soil slopes of the mountains of Zarafshan, Aloy and Turkestan. It has tall, large, yellow flowers and emits a distinctive smell. Adonisin, which is used in medicine for medicine, is obtained from this plant.



A



B



C

**17-picture. A. *Aconitum talassicum* Popov B.. *Adonis turkestanica* (Korsh.) Adolf C. *Nigella sativa* L**

## **TASKS:**

1. Getting to know the characteristic features of the representatives of the Aiktovanodash family (pay special attention to the variety in the flower structure).
2. Draw a general view of the identified (studied) species.
3. Draw the flower structure and diagram.
4. Using identifiers or "Flora of Uzbekistan", identify the representatives of 2 groups and show the systematic signs that differ between them.

## **PROCEDURE:**

As an example, let's get acquainted with the poisonous ranunculus (*Ranunculus sceleratus*), which is widespread in hayfields, forests and fields.

It is a perennial with a height of 30-100 cm. The lateral root is a tap root. The stem is upright, branched, round, and hollow. The leaves are simple, arranged in a row on the stem. Lower leaves are long-banded, claw-like. The upper leaves are short-banded or unbanded.

Flowers are solitary or in 2-3-flowered sympodial inflorescences, actinomorphic, hemicyclic. Petals 5 green or yellow-green, free. Petals are also free, 5, yellow, there are nectarines at the bottom. Androceus has a large number of anthers located separately. The gynoecium consists of numerous apocarp seeds.

The node is upper, single-celled.

The flower formula is  $Sa5So5A\infty G\infty$ . The fruit is a nut.

At the end of the work, the family, genus and species are identified with the help of identifiers.

For example:

Ayiktovanda \*  $Sa5 So5 A\infty G\infty$

Sugur is in the grass \*  $Sa5 So\infty A\infty G\infty$

The following species of the Ranunculaceae Juss. family - Knoring's isfaragi (*Delphinium knorringianum*), Zarafshon's saffron (*Acanitum seravschanicum*), White saffron (*Acanitum thalassicum*), Boysun's anemone (*Anemone baissensis*), Bukhara's anemone (*Anemone bucharica*), choice anemone (*Anemone protracta*), Golden beaver (*Adonis chrisocyathus*), Hairless beaver (*Adonis leiiosepala*), Altai trollius (*Trollius altaicus*) are included in the "Red Book" of the Republic of Uzbekistan.

## **REINFORCEMENT QUESTIONS:**

1. Describe the habitats of representatives of the bear family and representatives of the parpi family.

2. Determine the Latin and local names of the species of the genus used in medicine, and their distribution areas in nature.
3. What place does the family occupy in the evolution of flowering plants?

### **PRACTICAL EXERCISE 8**

**Topic: Magnoliaceae (*Magnoliophyta, Angiospermae*), a section of flowering or closed-seeded plants. Class *Caryophyllidae*, family *Caryophyllales. Caryophyllaceae* family (2 hours).**

Materials needed: herbariums, plant identifier, pictures, charts, fixed flowers, tubers, tubers, seeds, magnifying glass, tweezers, preproval nina Freshly cut plant and dried herbarium materials: Carnation (*Dianthus star o* Parts of the vegetative and generative organs of t (*Stellaria*) etc., fixed in alcohol. etc.

#### **GENERAL CONCEPT:**

Cloves are considered to have descended from ancient bears. Representatives of this class are adapted to grow in arid zones. Therefore, they are more common in deserts and semi-deserts. But in the mountain areas, you can find a lot of plants belonging to the carnation family. Representatives of the class consist mainly of grasses and shrubs or low trees. Flowers are bisexual, rarely unisexual. This class includes 3 tribes, about 11,500 species belonging to 650 genera.

Carnations (*Caryophyllales*) tribe.

The tribe includes 17 families. Among them there are families such as cloves, cactuses, shorates, and gultokhorazets.

Carnation family (*Caryophyllaceae*).

This family includes 2000 species of plants belonging to 80 genera. 122 species of 24 genera grow in Uzbekistan. Representatives of this family are annual and perennial herbs with opposite leaves. Flowers are 5-round. There are 4-5-10 stamens, 1-2-5 females, the top node, the fruit is small. They grow in all zones of the Earth. 10 species belonging to the cherniguldas family are included in the Red Book of Uzbekistan.

Studying the structure of representatives of the *Caryophyllaceae* family.

#### **TASKS:**

1. Describe the carnation family based on the common features of angiosperms.
2. Observe and describe the structure of stems, leaves, flowers and fruits of species belonging to the family.
3. Study pollinating and seeding flowers separately and draw their picture.



4. Compare their formula and diagram.
5. Use the detector to identify the species at hand.

### **PROCEDURE:**

As an example, let's get acquainted with the representatives of the Chinniguldosh family.

Representatives of this family are annual and perennial shrubs. Their stems are cylindrical, with jointed false dichotomous branching. The leaves are simple and opposite, sessile, sometimes membranous. Their flowers are straight, colored singly or in dichazy inflorescences. Most of the time, 2 sexes, florets, usually arranged in a pentatype, 5 circles. The saffron is divided into sepals and crowns, sometimes with a simple saffron. 5 rose petals. Sepals are compound or free, 4-5 teeth. The petals are 4-5, alternating with the teeth of the calyx. When there are 5-10 pollinators, pollinators in the outer circle are located opposite the petals. The seed has 2-5 fruit leaves. The node is upper, single-celled. The fruit is a pod or nut, sometimes a dry berry-fruit. The bag opens from the teeth at the end.

The presence of saponins in vegetative organs, in particular, in the underground part, is a characteristic feature of representatives of this family. Such saponins accumulate a lot in the roots of etmak and gypsophila. Etmak began to be cultivated in Uzbekistan as a technical plant. Due to its foaming properties, it is used in the national economy (in the preparation of nisholla). In medicine, it is used as an expectorant. There are several other representatives who will be medicine. For example, Grijnik-saminchop Insignificant for fodder. The flowers of some species are cultivated as decorative plants because they are houseplants. For this purpose, 70 types of cloves are grown. Among them, the Chinese carnation (*Dianthus Chinensis*), as well as the perennial Turkish carnation (*Dianthus barbatus*) and the Dutch carnation (*Dianthus Coryorhylus*) imported from Central and Western Europe are widely cultivated.

**Flower's formula: SA(5) SO5 A5+5 G (5)-(2)**

### **REINFORCEMENT QUESTIONS:**

1. Describe the habitats of representatives of the genus carnation
2. Determine the Latin and local names of the species of the genus used in medicine, and their distribution areas in nature.
3. What place does the family occupy in the evolution of flowering plants?



**A. *Dianthus tetralepis* Nevski**



**B *Stellaria neglecta* Weihe  
18-picture. *Caryophyllaceae* family**

## **PRACTICAL EXERCISE 9**

**Topic: Carnation class (*Caryophyllidae*). *Saryophullales* tribe.  
*Chenopodiaceae* family**

**(2 hours).**

**Required materials:** herbariums, plant identifier, pictures, tables, fixed flowers, corms, tubers, seeds, magnifying glass, tweezers, preproval Nina Freshly cut plant and dried herbarium material, rhizomes. reproved needle

**GENERAL CONCEPT:** Representatives of this class are adapted to grow in arid (arid) zones. Therefore, they are more common in deserts and semi-deserts. But in the mountain areas, you can find a lot of plants belonging to the carnation family. Representatives of the class consist mainly of grasses and shrubs or low trees. This class includes 3 tribes, about 11,500 species belonging to 650 genera.

The *Caryophyllales* tribe includes 17 families. Among them there are families such as cloves, cactuses, shorates, and gultokhorazets. Among them, the representatives of the *Shurodash* family are extremely common. This family has

about 1,600 species and is found on all continents of the globe. It forms the basis of plants growing in the desert zone.

The members of the family of sycamores are grasses, shrubs and small trees.

The leaves are of different shapes (even within the same species). Flowers are collected in small, inconspicuous, spike-like inflorescences or in racemes in most representatives.

Calyx is simple, globose, consisting of 5 sometimes fleshy or membranous petals, free or joined. Most have bisexual or unisexual flowers. They are divided into 1-5 pollinators, which are located in front of the petals. The seed is 1, and it has one cell composed of 2-5 fruit leaves. The node is superior, unicellular, pollinated by wind or insects. Fruits are nuts or berries, sometimes clustered.

**TASKS:** 1. Give a botanical description of the white sorghum (*Chenopodium album*) and the common beet (*Beta vulgaris*) belonging to the beet family.

2. Draw the vegetative and generative organs and their parts of the studied plant species.

3. Compare representatives of two groups and show their similarities and differences.

4. Identify 2-3 types of studied family.

#### **WORKING PROCEDURE:**

1. the stem of a very common annual weed is 5-sided, the middle leaves are alternately rhomboid, irregularly toothed. Leaves and stems have flour-like powder. The edges and surface of the leaf are observed under a microscope, and it is seen that they are covered with bubble-like hairs.

The flowers are clustered, and the thyrses in the axils of the leaves are collected in the inflorescence. If we look at a bunch of flowers under a microscope, it can be seen that they consist of a large number of small flowers. The peduncle is simple cup-shaped, 5-petaled, with membranous edges. Flower formula  $R(5)A5G(2)$  (unisexual flowers are sometimes observed). The seed is hard, black, and shiny, with spermoderm.

2. The common beet is a biennial plant, the first year of which the seed produces a large tuberous, shortened stem consisting of broad, long banded leaves and a thick root "root" that collects nutrients.

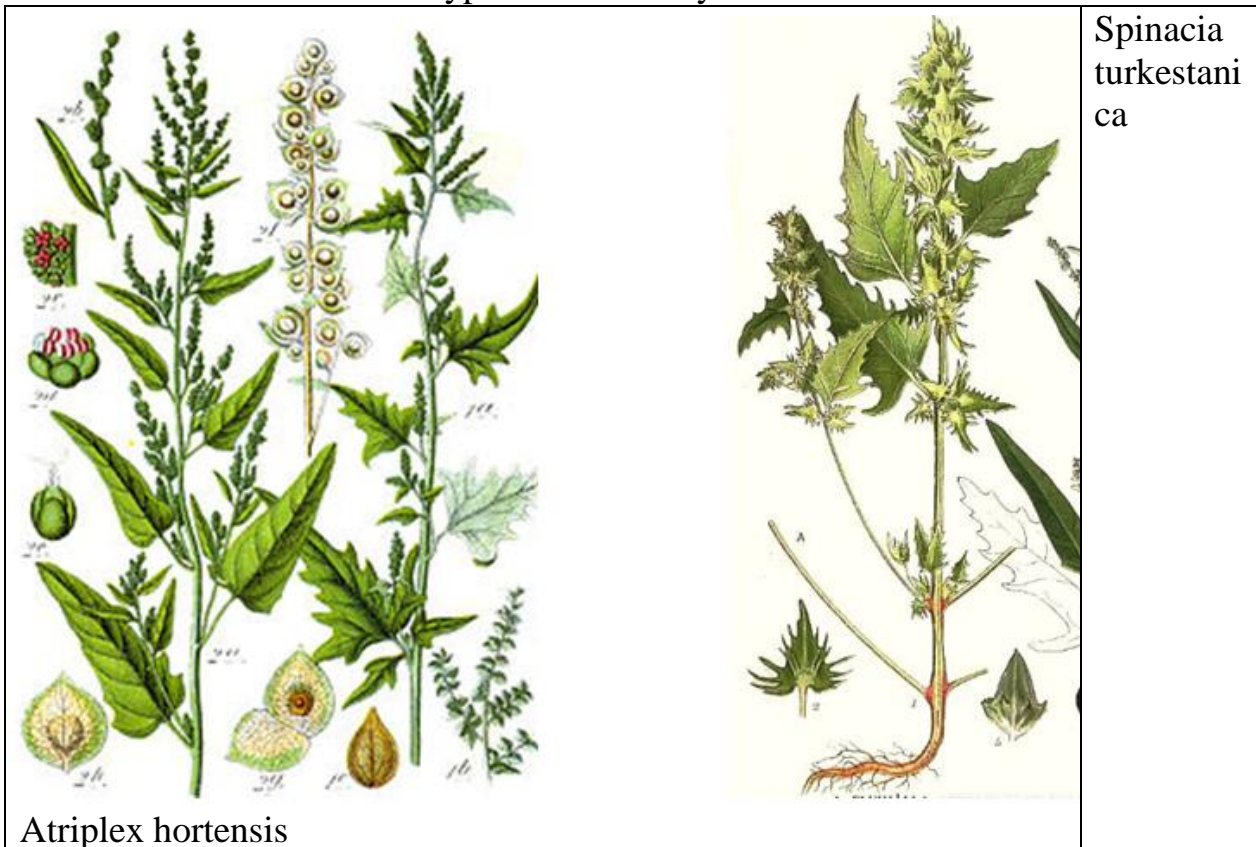
In the second year, a long, thick and very lush stem and flowers are formed. The flowers form clusters of 1-8 flowers, which in turn are collected in spikes or spikes. The flowers are bisexual, the peduncle is simple, five-petaled, green, small, attached from the bottom, and later becomes woody (hardens). There are 5 stamens, the node has 2-3 beaks. A pod that opens when the fruit is ripe.

This family is known by species such as beetroot (*Veta*), salt (*Chenopodium*), spinach (*Spiniacia*), olabuta (*Atriplex*), Izen (*Kochia*), salsola

(*Salsola*), saxovul (*Haloxylon*), the assignment of plant parts is drawn and determined based on.

**REINFORCEMENT QUESTIONS:**

1. Show the main systematic features of the Shoradosh family?
2. What categories and types of family are widespread in Uzbekistan?
3. Which families and types of the family are cultivated?



*Chenopodium album* L.



*Beta vulgaris* L.

19-picture.

## PRACTICAL EXERCISE 10

### Topic: Ancestor of Hemamelididae. Juglandales tribe. Juglandaceae family (2 hours)

**Required materials:** herbariums, plant identifier, pictures, tables, fixed flowers, tubers, tubers, seeds, magnifying glass, tweezers, preproval nina Freshly cut plant and dried herbarium material,

**GENERAL CONCEPT:** The family unites 60 species belonging to 7 genera. Mainly distributed in Eurasia and America. The flowers are unisexual, the stamens are located in a panicle. The seed is formed by the growth of two fruiting leaves. The fruit is a nut. The leaves are composed of dark feathery, complex, essential oil-producing glands.

Common walnut (*Juglans regia*) grows in Uzbekistan. It is widely distributed in Pskom, Ugam, Chotkol, Hisor ranges. Nuts are a relic of the era. At one time, it had a wide area, and then it was reduced. Valuable items are made from walnut wood. Its fruit is used in folk medicine and scientific medicine to treat various diseases. The pulp of the fruit contains 75% fat, and the peel contains additives.



**Juglans regia L.**



**Quercus robur L.**



20-picture.

**Emannamolar (*Fagales*) tribe.**

***Fagaceae* family.**

The oak family has about 900 species belonging to 18 families. They consist mainly of deciduous or evergreen trees and some shrubs. Mainly oaks

They are widely distributed in the Northern Hemisphere, partly in the Southern Equator. Most species of oaks are very large trees, reaching a height of 35-40 m.

The leaves are simple, arranged alternately. The flowers are of different sexes, the sepals are simple, the top node is composed of a panicle or a head. The fruit is a one-seeded nut.

Plants belonging to the oak family are very important in the economy. Valuable wood products are obtained from them. The bark is used in the preparation of seasonings. Oak is widely planted as an ornamental plant. 7 types of it are cultivated in Uzbekistan. Red oak (*Quercus robur*) is widely planted.

### **The genus *Platanales* (*Platanales*).**

#### **Plantain family (*Platanaceae*).**

This family includes one genus, 10 species. They are distributed in North America, Canada, Mexico, Mediterranean Sea, Fabian Himalaya, Indo-China, Balkan Peninsula and Central Asia.

We have one - Oriental plane tree (*Platanus orientalis* L. ). The homeland of sycamore is in Central Asia. As an ornamental plant, the sycamore gives a unique appearance in the streets and gardens. Sycamore is a deciduous plant, its leaves have side leaves. First a leaf emerges from the bud, then it turns into a flower. The flowers are unisexual, the pollinator flower is formed in a yellow head, and the seed flower is formed in a red head. Pollinated by the wind. There are 3-4, sometimes up to 7 warriors. Seed flowers are formed by the growth of 5-9 fruiting leaves.



21-picture. *Platanus orientalis* L.

Sycamores live up to 2000 years, in nature there are sycamores that have lived for 500, 1000 years. In Turkey (near Istanbul) you can find a maple with a trunk circumference of 18 m. A school was established in the trunk of a maple tree in the village of Sayrob, Boysun district, Surkhandarya region, where children received education. Maple wood is a valuable building material, it is not inferior to walnut wood in terms of strength. Eastern maple is included in the "Red Book" of the Republic of Uzbekistan.

**TASKS:** 1. Give a botanical description of common walnut (*Juglans regia*), red oak (*Quercus robur*) and oriental plane (*Platanus orientalis*).

2. Draw the vegetative and generative organs and their parts of the studied plant species.

3. Compare representatives of two groups and show their similarities and differences.

4. Identify 2-3 types of studied family.

#### **REINFORCEMENT QUESTIONS:**

1. Show the main systematic features of the family of walnuts?

2. What are the genera and species of the families of Yongokdosh, Emandosh and Chinordosh in the territory of Uzbekistan?

3. Which series and species of these families are cultivated?

### **11-PRACTICAL TRAINING**

**Topic: Dillenidae class. Cucurbitales tribe. Cucurbitaceae family**

**(2 hours)**

**Materials needed:** herbariums, plant identifier, pictures, charts, fixed flowers, tubers, tubers, seeds, magnifying glass, tweezers, preproval nina freshly cut plant and dried herbarium material.

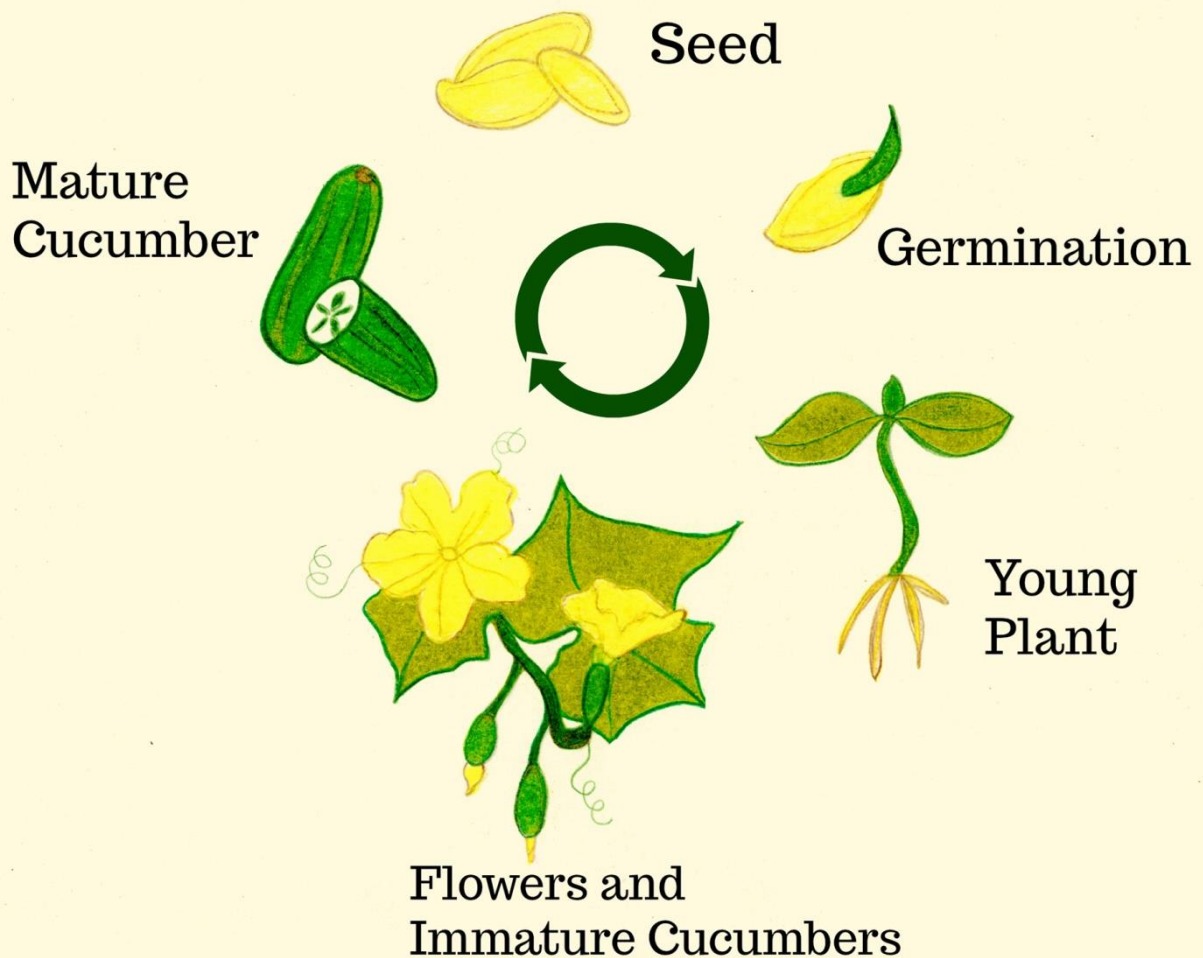
**GENERAL CONCEPT:** Annual and perennial herbaceous, in some cases, bushy and even woody species are also found. Most of the species belonging to the family are creeping, twining or clinging species. Their stems are long, hollow, covered with stiff hairs. Bicollateral conducting tubes are characteristic for the phloem in the stem.

The leaves are sessile, heart-shaped, the leaf blade is quite large, with a saw-shaped or claw-shaped section, located alternately. Are metamorphosed branches with simple or complex whiskers that perform the function of sticking, curling and wrapping Actinomorphic, four-rowed, five-membered, singly, unisexual, monoecious flowers are located in leaf axils. The flower mound is complex, the base part is turned into a flute. The sepal is five-toothed, the corolla is five-

notched, bell-shaped, yellow or white. The male flower has 5 stamens. In most species, four stamens are united, and one is separate, not connected.

However, in pumpkin (*Cucurbita moschata*), 5 stamens are contiguous, two-placed. The gynoecium is formed from three carpels. The lower node is three-lobed, rapidly enlarged, the column is three-parted, the seed pods are numerous, the fruits are berry-like, large, like pumpkins, melons or watermelons, and in some cases their weight reaches 10-25 kilograms. Its mesocarp and endocarp parts are juicy, and the exocarp part is very hard in some species (pumpkin) (even cases of lignification are observed).

## Life Cycle of a Cucumber



22-picture. Life cycle of a Cucumber

**Materials needed for practical work:**



Freshly cut plants and dried herbarium materials: parts of vegetative and generative organs of watermelon, melon, cucumber, pumpkin, etc. fixed in alcohol.

Assignment. 1. Describe squashes based on common features of angiosperms.

2. Observe and describe the structure of stems, leaves, flowers and fruits of species belonging to the family.

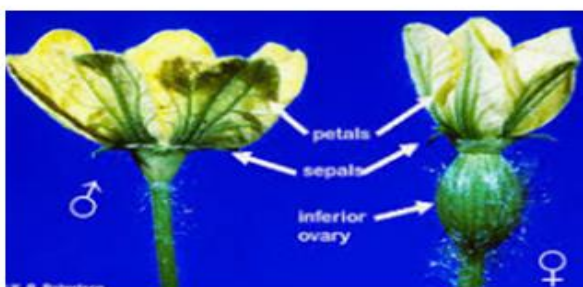
3. Study pollinating and seeding flowers separately and draw their picture.

4. Compare their formula and diagram.

5. Use the detector to identify the species at hand.

Work progress: Cucurbits are introduced to the family of cucumbers (*Cucumis sativus*) or melons (*Melo orientalis*). Nowadays, this cultivated plant is grown in temperate regions of the globe. The leaves of this annual grass are simple, short-lobed, alternate on the stem, and clipped like claws. All vegetative organs of the plant are covered with hard prickly hairs. The flower is actinomorphic, solitary, located in the leaf axil. The male flower has a double sepal, the calyx and corolla leaves are connate. There are five rooms, four of them are adjacent, and the fifth is located separately. The seeds in female flowers are three-lobed, with syncarp seeds, and the node is lower. There are many seeds. Flower formula:  $*Ca(5)Co(5)A(2)+(2)-1$  and  $Ca(5)Ca(6)G(3)$ . The fruit is a berry-like cucumber.

A picture of the plant organs is drawn and the types of pumpkins are determined using the detector.



23-picture.

## REINFORCEMENT QUESTIONS:

1. What information do you have about the geographical distribution and life form of gourds?
2. Describe the structure of the stem, leaf and flower of the representatives of the family.
3. How is an androcelium flower different from a gynoecium flower?
4. What are the economic significance of the plants belonging to the gourd family?

## PRACTICAL EXERCISE 12

### **Topic: Acquaintance with representatives of the Capparales tribe, cabbage family (Brassicaceae) (2 hours)**

**Necessary materials:** Herbarium or living object from members of the Brassicaceae family: wild radish (*Raphanus raphanistrum*) or cultivated radish (*R. sativus*), as well as *capsella bursa-pastoris*, etc.

**GENERAL CONCEPT:** Members of the cabbage family are mainly annual and perennial herbs.

Many species of the family are cultivated as vegetables or dyes, medicinal, oil plants (cabbage, radish, radish, turnip, okra, mustard, etc.). The leaves are simple, cut and arranged alternately. The flower structures are the same and form a spiky or spiky inflorescence. Petals are free, arranged in four, two circles. The petals are also 4, freely (separately) located in a circle. Androeciums are six in two circles - 4 in the inner circle and 2 short ones in the outer circle. Gynecaceae consists of two fruit leaves. The knot is top. The fruit is a pod or pod.

**TASKS:** 1. Acquaintance with the structure of family plants (with the help of herbarium or living objects of cabbage and jag plant), description of systematic features.

2. Draw a diagram of the flower structure, arrangement of parts of the studied and described plant species.

3. Study and compare fruits found in different parts of the family and their types.

**PROCEDURE:** Members of the Radish family (*Raphanus*) are annual and biennial plants, some are weedy (*R. raphanistrum* - wild radish) and some are cultivated as vegetable plants. .

For example, radish (*R. sativus subspradicula*) is a well-known annual vegetable that blooms the same year it is planted.

The root is 3-13 cm, white, red, yellow.

For the study, herbarium materials obtained at different growth stages of the radish plant (rosette, leaf, flowering and fruit formation) are used.

The branch with a flower, the branching of the stem, and its length are determined.

Leaf morphology is studied and drawn. Inflorescences - a common shingle and a flower in it, its structure, fruit formation and forms are studied and drawn.

It is described why the fruit is a pod that does not open, and what is observed is drawn.

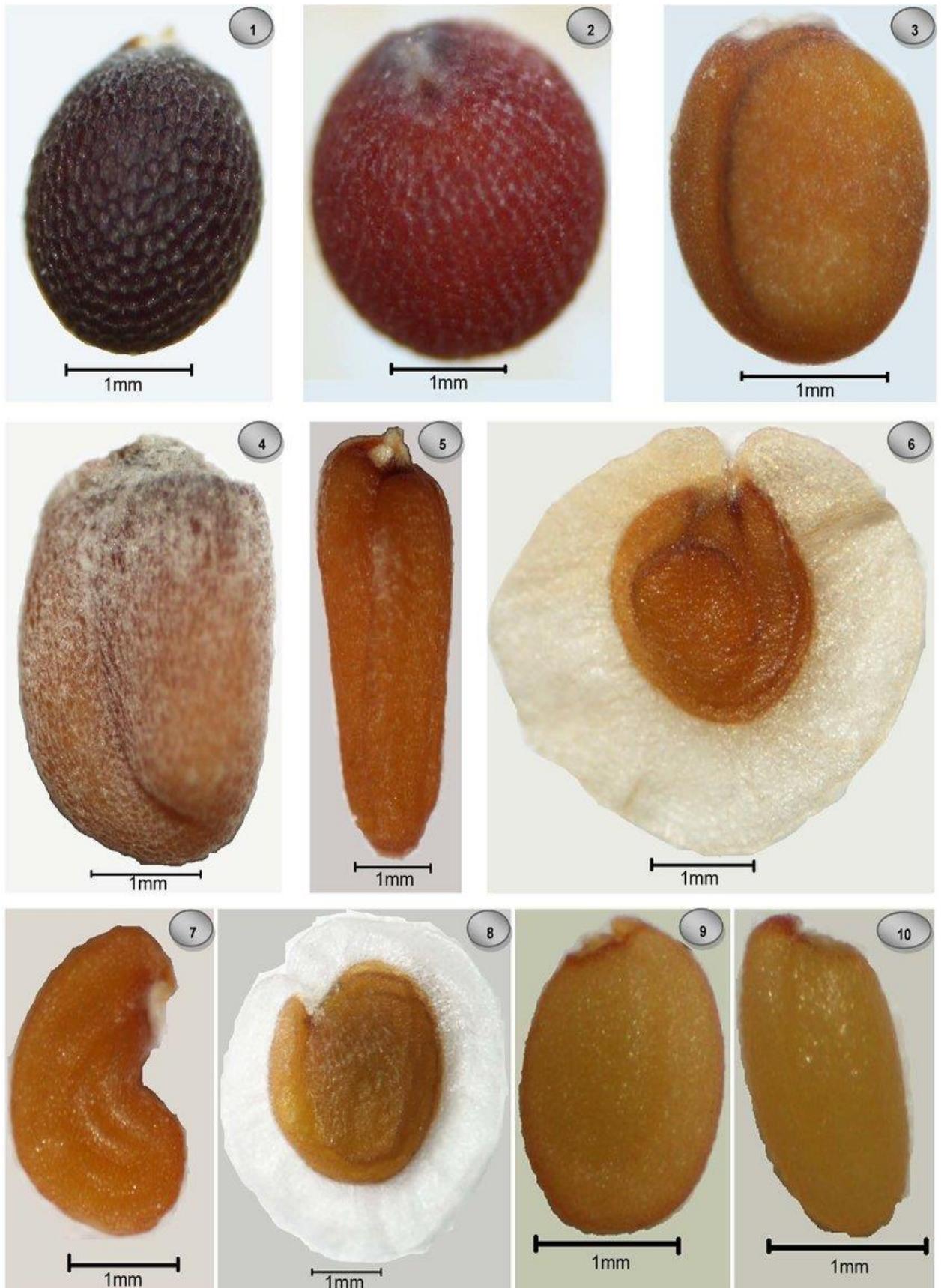
At the end, the species such as jag-jag and kurtena are identified with the help of a detector, and their signs are compared with radish.



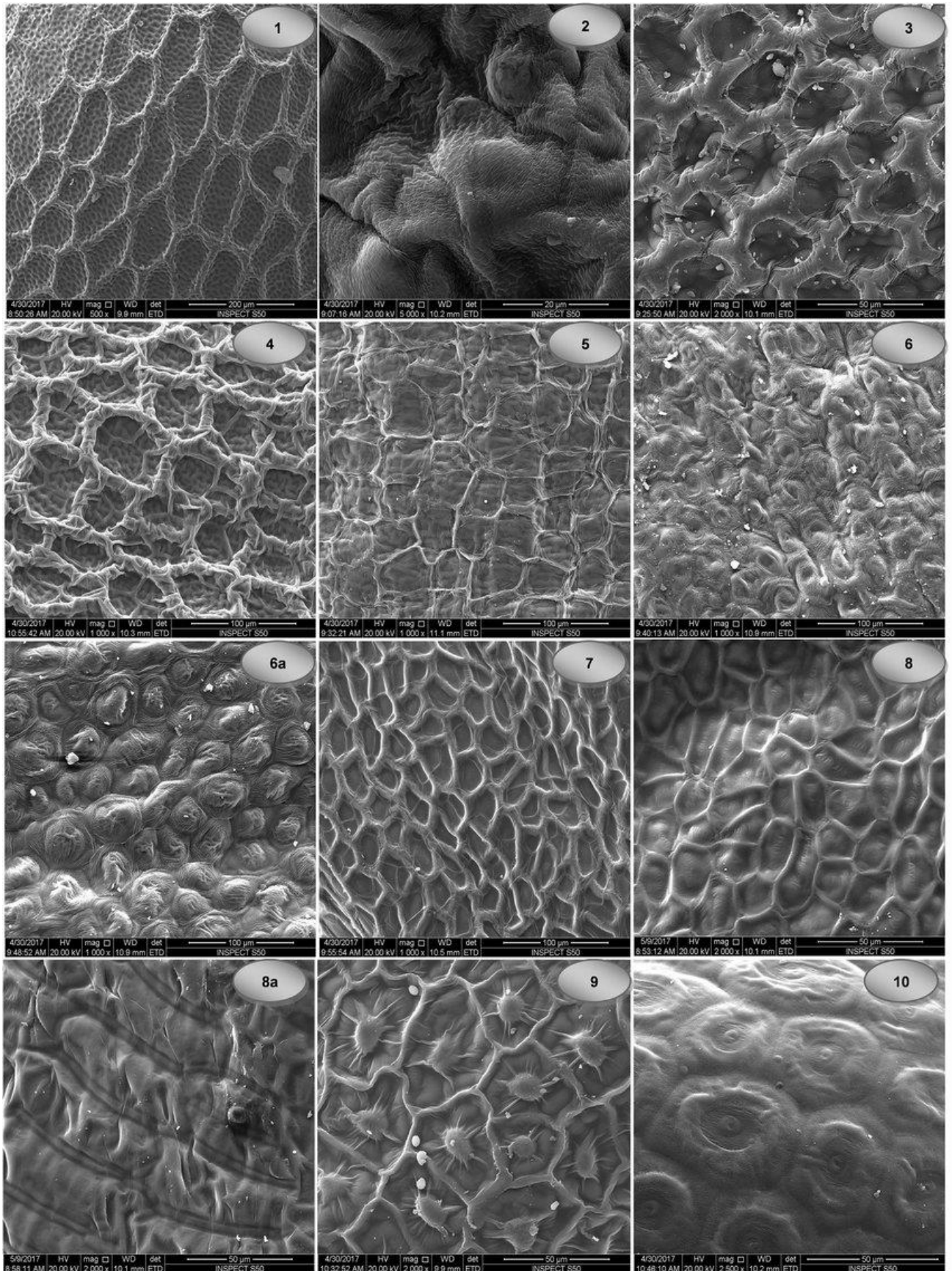
24-picture. Genetic diversity within the Brassicaceae family. a–f Light microscopy and SEM (scanning electron microscope) pictures of wild type and ful mutants, respectively, in *Arabidopsis thaliana* (a, b), *Capsella rubella* (c, d) and *Lepidium campestre* (e, f). *Arabidopsis* ful mutant is ful-2 (Ferrandiz et al. 2000) (b), *Capsella* ful is an unpublished EMS allele (d), and *Lepidium* ful is a 35S::LcFUL segregating line that in some cases exhibits ful phenotype, (phenotype correlates with decreased LcFUL expression (Lenser and Theissen 2013) (f). g Diversity of pod shape and size (from left): globular *Camelina microcarpa*, flat and round *Lunaria annua* (which in contrast to *Arabidopsis*, *Capsella* and *Lepidium* is bilaterally flat due to an exceptionally extended replum), and elongated *Fezia pterocarpa*, *Brassica oleracea*, *Sinapis alba*, *Brassica carinata*, *Brassica napus* and *Brassica rapa* (each of which shows different style forms). h Inflorescences (from left) of *Camelina sativa*, *Lepidium densiflorum* and *Crambe abyssinica*



**25-picture.** Fruit morphology of 10 species of Brassicaceae as revealed by light microscope: 1. *Brassica juncea*; 2. *Brassica tournefortii*, 3. *Eruca sativa*, 4. *Raphanus sativus*, 5. *Cakile arabica*, 6. *Savignya parviflora*, 7. *Coronopus didymus*, 8. *Farsetia burtonae*, 9. *Cardamine hirsute*, 10. *Sisymbrium irio*.



26-picture. Seed morphology of 10 species of Brassicaceae as revealed by light microscope: 1. *Brassica juncea*; 2. *Brassica tournefortii*, 3. *Eruca sativa*, 4. *Raphanus sativus*, 5. *Cakile Arabica*, 6. *Savignya parviflora*, 7. *Coronopus didymus*, 8. *Farsetia burtonae*, 9. *Cardamine hirsute*, 10. *Sisymbrium irio*.



27-picture. Scanning electron microscope micrographs of seeds (a), Surface sculpture of wing margin; 1. *Brassica juncea*; 2. *Brassica tournefortii*, 3. *Eruca sativa*, 4. *Raphanus sativus*, 5. *Cakile Arabica*, 6. *Savignya parviflora*, 7. *Coronopus didymus*, 8. *Farsetia burtonae*, 9. *Cardamine hirsute*, 10. *Sisymbrium irio*.

## REINFORCEMENT QUESTIONS:

1. What are the main systematic characteristics of the Karamdosh family?
2. Describe the categories and species that are cultivated in culture.
3. Common species that grow wild in our republic and what category do they belong to?

## PRACTICAL EXERCISE 13

**SUBJECT:** tribe (Malvales). *Malvaceae* family.

**Necessary materials:** Herbarium of representatives of the widespread family (cotton - *Gossypium*, hemp - *Hibiscus*, button-flower-Malva, flower-Althaea, etc.).

**GENERAL CONCEPT:** The tribe includes 11 families, 248 genera and more than 4000 species. Most representatives of the family are distributed mainly in tropical and subtropical regions. Representatives of *Malvaceae* can be found in other regions as well. Representatives of this family are grasses, shrubs and woody plants, the family includes 85 genera and 1000 species. 17 species belonging to 6 families grow in Uzbekistan.

The leaves are simple, clipped, claw-like. The flowers are bisexual, mostly actinomorphic, with 5 corollas and sepals. The sepals are usually double-layered (with lower and upper sepals). There were many anthers, and the pollen threads grew together. Gynoecium syncarp, carpels five or more, node superior.

Currently, 35 types of cotton are known, but only five types of industrial importance are cultivated:

African-Asian cotton of cultivated fine fiber cotton (*G. herbaceum*); *Gossypium arboreum* (*G. arboreum*) - Indo-Chinese cotton; medium fiber cotton (*G. hirsutum*) is native to Mexico, *Gossypium barbadense* (*G. barbadense*) and *Gossypium trilobatum* (*G. trilobatum*) are West Indian cotton. *H. cannabinus*, which belongs to the hemp (*Hibiscus*) family, is widely cultivated in our republic as a fiber plant. A long, elastic fiber is obtained from its stem. Homeland India and Iran. *Malva neglecta*, which grows as a weed, as well as *Althaea*, which is widespread in mountain and sub-mountain regions, also belong to this family.

**TASK:** 1. Acquaintance with the structures of the vegetative organs, flowers, and fruits of the flowers and flowers belonging to the family of flowers and flowers.

2. Drawing pictures of leaves, flowers and their parts, as well as fruits of each observed species, expressing flower formulas.





28-picture. Identification of studied species with the help of an identifier.

**PROCEDURE:** 1. Study of typical representatives of the family from herbarium materials. growth conditions, leaf, leaf type, petals, inflorescence, flower structure, general formula and diagram of the flower, the presence of nectaries at the base of the flower, i.e. at the base of the corolla, what insects pollinate the plant, the structure of pollinators and seeds and at the same time their ripening, immaturity, the type of fruit and its structure are determined. Types of branching: monopodial and sympodial branching and its importance, location of nodes (upper and lower) are determined. Fruit types are identified as multi-seeded carpels or single-seeded nuts. It is determined that some types of plants included in Gulkhari-dosh are of great practical importance.

Get acquainted with other representatives of the herbarium and give them a botanical description.

## REINFORCEMENT QUESTIONS:

1. What are the unique systematic features of Gulkhariidosh family?
2. Representatives of the family (category and species) that are cultivated in culture, what is their significance?
3. Give information about the species that grow naturally in our republic, their living conditions, life forms and importance.

## PRACTICAL EXERCISE 14

**Topic: Class of competitors (Rosidae). The tribe of Ra'nonamos (Rosales), the family of Ra'nodos (*Rosaceae*).**

Materials needed: Herbarium specimens or living objects of flowers of the genera Raspberry (*Rubus*), Rosehip (*Rosa*), Apple (*Malus*), Hawthorn (*Grategus*), Cherry (*Cerasus*) and Prunus (*Prunus*). Specimens of flowers of the indicated plants fixed in alcohol.

**GENERAL UNDERSTANDING:** The family of Ranadozat has about 3000-3350 species, including 100 genera. 96 species belonging to 11 families grow in Uzbekistan. Many species have been cultivated as fruit crops since ancient times. The representatives of the family are trees, shrubs and grasses and are found in various ecological conditions.

The leaves are alternate, sometimes opposite, simple or compound, all sided. Representatives with a large number of apocarpous gynoeciums bring them closer to magnolias (in some representatives, the number of flower parts, the lower part of the node).

In general, it differs from other species in the fact that the structure of the flower is adapted to the distribution of fruits and seeds.

The characteristic features of the family are the structure of the gynoecium and the inflorescence. The corolla, sepals, base of petals and stamens join together to form a hypanthium.

The family of Ranadosha is divided into 4 families based on the structure of flowers and fruits.

1. Spiraeoideae family - Spiraeoideae. Shrub, simple leaves. The flower is small and collected in a panicle or shield-shaped inflorescence. The inflorescence is flat or partially concave. Measi has compound leaves and small fruit. The flower formula is  $Sa(5)So5A\infty G5$ . The most common species of this family are hairy tubulga, baljuan tubulga, and others.

2. Rosoideae family - Rosoideae. Shrubs and grasses are plants with mostly compound, lobed leaves. Flower structure is different in different species. Some representatives also have a lower cup (goose panja, strawberry). The gynoecium is numerous and apocarpous. Flower's formula is  $Sa(5+5)So5A\infty G\infty$ . The flower formula of representatives of the Namatak family is  $Sa5So5A\infty G\text{---}\text{---}\infty$ .

3. Family of apples - Pomoideae. Representatives of this family are trees and shrubs, the leaves are mostly simple and sometimes complex. The flower is five-lobed, the sepals are usually five. Gynoecium syncarp. The cup shape of the flower head and the bottom of the knot are considered to be a characteristic sign of this family.

The flower formula is  $*Sa(5)S5A\infty G(5)$ . The fruit is called an apple-like fruit. Examples of this family are apple, pear, quince, hawthorn, and chetan.

4. Family of plums (Prunodeae). The representatives of this family are trees and shrubs, the leaves are simple, the flowers are slightly concave, and the carpels are single. Flower formula  $*Sa(5)So5A\infty G1$ . The fruit is a seed (dry or wet). Cherry (Cerasus), apricot (Armeniaca), peach (Persica), almond (Amygdalus) of this family are widespread and are of great importance in horticulture.

**TASK:** 1. carefully study the representatives of the series belonging to each family and give them a botanical description

2. Study and draw the leaves, flowers and parts of flowers, fruits of the representatives of the studied species.

3. Identification of plants using identifiers (based on systematic signs).

**PROCEDURE:** When studying the flowers of family representatives, pay attention to the fact that the bubble of different shapes has a flat and concave flower instead. It is observed that the sepals, corollas and stamens of the flowers, which have instead of a bubble and flat flower, are located below the seeds. As a result of the joining of the lower parts of the edges of the flower bed and the lower parts of the sepals, it forms hypanthia (carvings of various shapes). The attachment of seeds to the base of the hypanthium or its edges is observed.

Look at the flower from the side. Did hypanthium form? Cut the flower lengthwise to determine its shape. The state of the node is determined, and its fruit is identified. Attention is paid to which parts of the flower are involved in the formation of fruit. When characterizing the family, compare life forms, types of leaves, arrangement of leaves with or without petals, types of inflorescences, whether flowers are straight or curved, number of flower members. Describe the most important, economically important species.

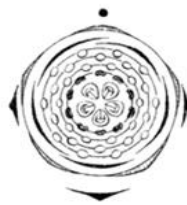
**REINFORCEMENT QUESTIONS:**

1. Name the main systematic features of the Ranadosha family.
2. Latin and local names and descriptions of Asian genera and species of the apple family that are widespread in the territory of Uzbekistan.
3. Give a botanical description of the cultivated species of the Namatakdoosh family.
4. Describe wild and cultivated members of the plum family.

## 15- PRACTICAL TRAINING

### Topic: Fabales tribe. Legumes family Fabaceae (Leguminosae).

**Materials required:** Herbarium specimens: Meadowsweet (*Lathyrus pratensis*), Purple (*Caragana arborescens*), Common pea (*Pisum sativum*), Common alfalfa (*Medicago sativa*), Sweet brain (*Clycyrrhiza glabra*) and Mythical (*Thermopsis*), representatives of the sebarga (*Trifolium*) family.



$Ca_{(5)}Co_5A_{\infty}G_5$



$Ca_5Co_5A_{\infty}G_{\infty}$



$\text{♂} * Ca_5 Co_5 A_{(5+5)} G_{(5)}$

29-picture. Floral structure of the family

**OGENERAL CONCEPT:** Representatives of this tribe are trees, shrubs, grasses, lianas, and annual and perennial grasses that are widely distributed on the surface of the earth.

The tribe has only one family of Caesalpinioideae, 650 genera, 18,000 species, and is divided into three families: Caesalpinioideae, Mimosoideae, and Papilionoideae.

Representatives of the Fabaceae family are widespread mainly in non-tropical regions and occupy the main place in the tribe.

The basis of the mimosa family is tree plants in tropical and subtropical regions, their distinctive feature is the fact that their flowers are actinomorphic. Чангчилира free (acacia - representatives of the Acacia family).

The Sesalpine family consists of trees, shrubs, and lianas, and they are plants distributed in tropical regions. Some varieties are cultivated in our country.

For example, Iudino tree (*Cercis siliguastrum*), cassia acutifolia (*Cassia acutifolia*) and others.

The flowers of the members of this butterfly family are collected in a shingle, umbel or head-shaped inflorescence. Sepals compound, 5-toothed, actinomorphic or zygomorphic. A butterfly-shaped flower has 5 petals, 3 of which are free (shoulder and 2 paddles) and 2 are joined to form a boat.

The structure of the pollinators is important in determining the representatives of some groups of the Burchakdosh family. Sofora, representatives of the legendary series, all 10 skiers are free. In other genera, all 10 anthers join together to form a tube (in *Supinus*, *Genista*, and other genera).

In most representatives of the family, 9 pollinator threads join to form a tube, and one is free (pea, alfalfa, sebarga, etc.). The fruit is a pod.

**TASKS:** 1. To study species that differ in terms of the structure of vegetative and generative organs from the representatives of the family of cycads, to compare their systematic features, and to classify them.

2. Drawing the stem, leaf, flower and flower parts, fruit of the classified species.

3. Identification of family, genus and species with the help of identifiers (yakhdi tree, alfalfa, karagan, legend, eryongak and yantak.)

**WORKING PROCEDURE:** As an example, we take clover (*Medicago sativa*) or creeping trifolium (*Trifolium repens*).

Alfalfa is a perennial herbaceous plant, 40-80 cm tall, with an arrowroot and nodules containing nitrogen-fixing bacteria. Upright growing, branched stems have complex, 3-lobed leaves in a row. The flowers are zygomorphic, have a double

sepal and are collected in a single inflorescence. The fruit is a spirally wrapped pod.

The flower formula is as follows  $Sa (5) So_{3+} (2) A(9)+1G^{-1}$

Show the economically important species of the most important genera and identify 2-3 species with the help of identifiers, giving them a botanical description. (Forage, medicinal, nutritional species).

### **REINFORCEMENT QUESTIONS:**

1. What are the unique systematic characteristics of the subfamily of butterflies?
2. Describe the series and species of the family that are cultivated as annual plants.
3. Show the types used in the pharmaceutical industry in our country.
4. What are the types of fruits and their economic importance?

## **16- PRACTICAL TRAINING**

### **Topic: Ziranamos (Apiales) tribe. Apiaceae family.**

**Materials needed:** Herbarium of wild carrot (*Daucus carota*), parsley (*Aethusa cynapium*), sedge (*Anethum graveolens*), etc. and their flowers, fruits and seeds fixed in alcohol, magnifying glass or microscope.

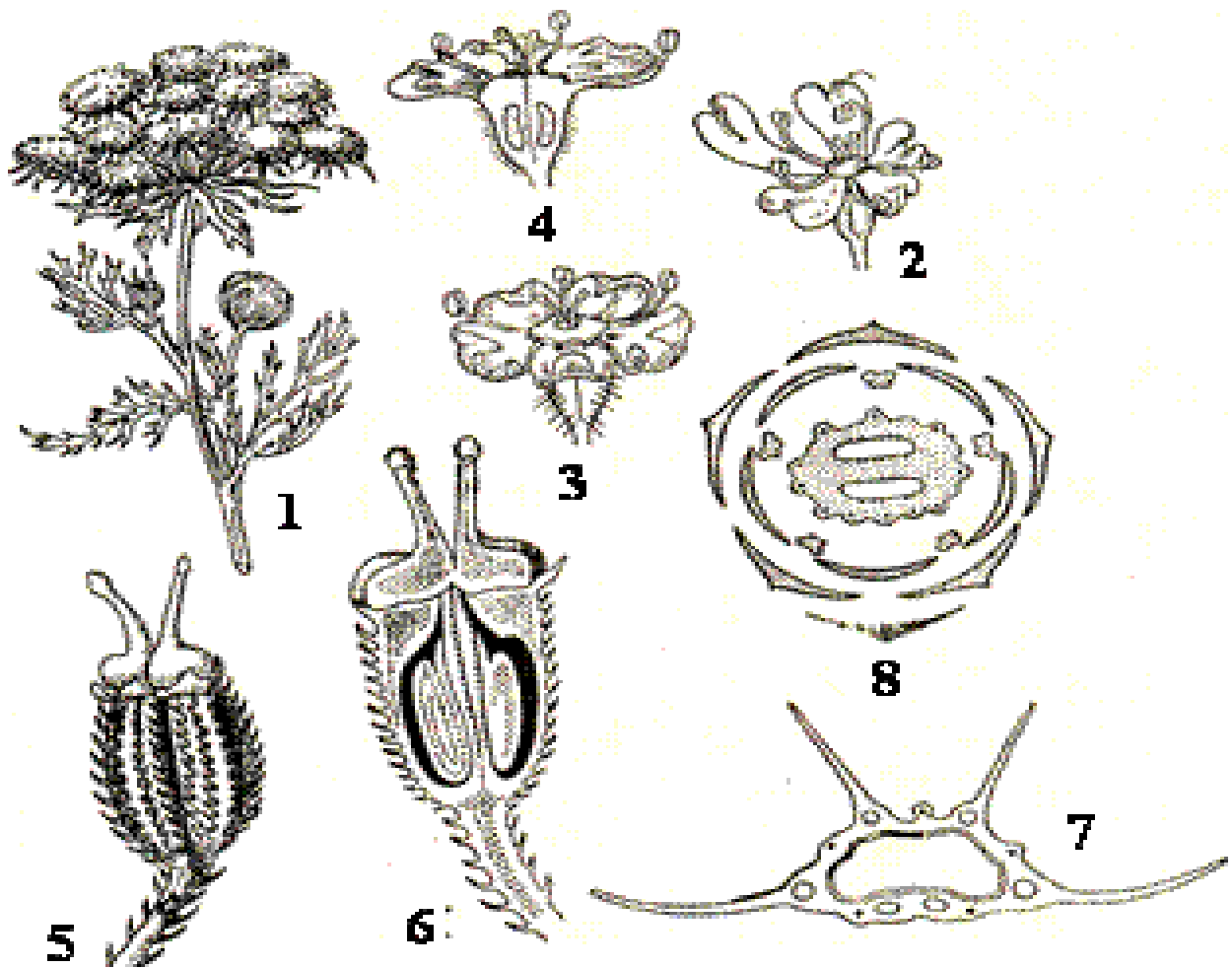
**GENERAL CONCEPT:** Most of the plants belonging to the family are annual, biennial and perennial herbs, the leaves are sessile, the flowers are bisexual, actinomorphic, arranged in an umbrella-shaped flower cluster, the calyx is mostly reduced, and the corolla is free. , the seed is one, the node is lower, the seed is epidospermous. The family includes more than 30,000 plant species belonging to 200 genera, distributed in the temperate climate region of the Northern

Hemispheres. Flower formula  $*Ca_3 Co_5 A_5 G_1$ , fruit two-seeded, seed epidospermous.

In the classification of umbels, the structure of the flower, its shape, the presence or absence of the flower and stem wrapping, the monoecious or dioecious flower, the shape and structure of the flower, seed, fruit leaf, the external and internal structure of the stem, the root structure, especially the presence or absence of the terminal its absence is crucial.

### **TASK.**

1. based on the structure of the species belonging to the family carrot (*Daucus carota*), cumin (*Carum carvi*), fennel (*Anethum graveolens*), carpet (*Ferula assa foetida*), study and describe their different characteristics. Pay special attention to the signs that are necessary to identify these species in the detector. Try to study their fruit and seed structure carefully.



30-picture. Carrot (*Daucus carota*):

1- flower branch; 2- the outer flower of the umbrella; 3- the middle flower of the umbrella; 4 - cross section of a flower; 5- fruits, 6 - longitudinal section of fruits (endosperm is painted black): 7- cross-section of me vas, 8 - diagram of flower.

2. Based on the morphological analysis of the plant, write their formula and diagram.
3. Note the variety of seeds and fruits and draw a picture of the characteristic fruits and seeds for each species.
4. Identify the species studied using the detector.

**WORK PROGRESS.** An example is carrot (*Daucus carota*). Vegetative (underground and aboveground) and generative organs (inflorescence, flower, fruit) are carefully examined and a complete description of the plant is written. For a complete description of the plant, prepare a cross-section of the fruit and observe it under a microscope. It is necessary to prepare a preparation for this. To prepare the drug, the fruit of the plant is placed in the center of the pod and cut with a sharp razor. The prepared section is observed under a microscope.

Wild carrot is a two-year plant with a height of 30-100 cm. The root system is arrow-rooted, the main root is thickened, and it produces "root fruit" in the first year of its life. This thickened tuber is usually called a carrot. Due to the pigments in the chromoplast, it has an orange, golden color.

The stem is formed in the second year of the plant's life, it is upright, branched, joints and joints are clearly formed, rounded, ribbed. The leaves form pre-root ball leaves in the first year, and alternate banded compound leaves in the second year. A complex umbrella with balls. The flowers located in the umbel are different, the ones located in the middle are actinomorphic, the edges are zygomorphic, five-membered, the calyx leaves are reduced, and they consist of five vitreous scales. The corolla consists of 5 free white petals with a slightly free tip.

The node is lower, two-chambered, there is one seed pod in each chamber. Flower formula  $*Ca_5 Co_5 A_5 G(2)$ . The fruit is bilobed, round, somewhat compressed from the edge. A cross section of a carrot is observed using a microscope. The internal structure of the fruit can be clearly observed in the section. In the process of observation, special attention is paid to the epidosperm, which occupies the main part of the fruit, and the seed coat surrounding it. The morphology of the plant is studied and its picture is drawn. At the end of the PRACTICAL TRAINING, the type of plant is determined using the identifier.

### **REINFORCEMENT QUESTIONS:**

1. What do you know about the distribution area and life forms of plants belonging to the umbel family?
2. Describe the structure of vegetative and generative organs of family members.
3. How are Importance of plants belonging to the umbel family in the national economy?





Anethum graveolens L.

Daucus carota L.

**31-picture**

**PRACTICAL EXERCISE 17**

**Lamiidae class. The tribe Lamiales. Family of mints (Lamiaceae) or Labiatae.**

**Necessary materials:** Herbarium specimens: Tograykhan (*Origanum tyttanthum*), Asian mint (*Mentha asiatica*), Deer grass (*Ziziphora brevicalyx*), Marmarak (*Salvia sclarea*), Lemongrass (*Melissa officinalis*) and Raykhon (*Osimun basilicum*), Representatives of the white lamium (*Lamium album*) family.

**GENERAL CONCEPT:** Lamiidae is a class phylogenetically close to ancient ranoids. It includes 40,000 species belonging to 11 tribes, 51 families and about 2,400 genera. Flowers are zygomorphic. The class includes plants with different life forms. The Lamiales tribe includes 3 families: sytemflowers, mints, and balchikots. One of the families within the Lamiales tribe is the Mint family.

Mints (Lamiaceae) or Labiatae family. This family includes 200 genera and 3500 species. 214 species belonging to 38 families grow in Uzbekistan.

The stem of the representatives of the family is 4-sided. The leaves are simple, opposite on the stem. The petals are double-lipped, the upper lip consists of 2 petals, and the lower one has 3 petals. There are 4 swords, sometimes 2. Seed has 2 fruit leaves. The fruit is a nut. *Origanum tyttanthum* is a perennial plant with essential oil. One species grows in Uzbekistan. It contains 0.56-0.58% essential oil in its aerial part, 0.68-0.72% in its leaves, and 0.56-0.65% in its flowers. It is used in medicine as a diuretic, anti-insomnia, improving the functioning of the digestive organs. The flower formula is  $\uparrow Sa(5) So3+(2) A4$  or  $2 G-2$

**Tograykhan (Origanum) series.** Tograykhan is used as a spice for food. It can be used to add flavor to various soft drinks, perfumed soaps, and toothpastes. It is also a honey bee.

**Mint (Mentha) family.** 45 types of mint grow in Uzbekistan. Peppermint contains essential oils, 41-65% of which are menthol. Menthol is used in medicine, in the preparation of perfumes, and in the food industry. Peppermint is used to relieve toothache, treat headaches, and the blue part is used as an expectorant and stomach ache.

**There are 7 species of deer grass (Ziziphora)** in Uzbekistan, they consist of perennial and annual grasses. Due to the fact that there are many essential oils in the composition of the species of kiikikot, they are used as a medicinal, essential oil, and spice plant.

**Marmarak (Salvia) series.** 15 types of marmarak grow in Uzbekistan. Representatives of this category are also rich in essential oils. Several types of marmarak are used as medicinal plants.

**Significance:** The members of the family are used in the perfumery-cosmetics and food industries due to the fact that they are rich in essential oils. Most species are cultivated. Uzbekistan is rich in species belonging to this family. , Leonurus, Zufo (Nepeta), there are many species used in medicine. It is also planted as landscape plants (Marmarak).

**TASKS:** 1. To study species that differ in the structure of vegetative and generative organs from representatives of the mint family, compare their systematic features, and classify them.

2. Draw the stem, leaf, flower and flower parts, and fruit of the classified species.

3. Define family, genus and species using identifiers.

**PROCEDURE:** As an example, we will take mint (*Mentha asiatica* Boriss.) grown in culture.

Mint is a perennial, sometimes annual herb. It is scattered on the ground, along streams and canals. 45 types of mint grow in Uzbekistan, of which Asian mint (*Mentha asiatica*) is widespread. Field mint (*Mentha arvensis*) and curly mint (*Mentha erispe*) are cultivated. Peppermint contains essential oils, 41-65% of which are menthol. Menthol is used in medicine, in the preparation of perfumes, and in the food industry. The flower formula is as follows  $\uparrow Sa(5) So3+(2) A4 G-2$

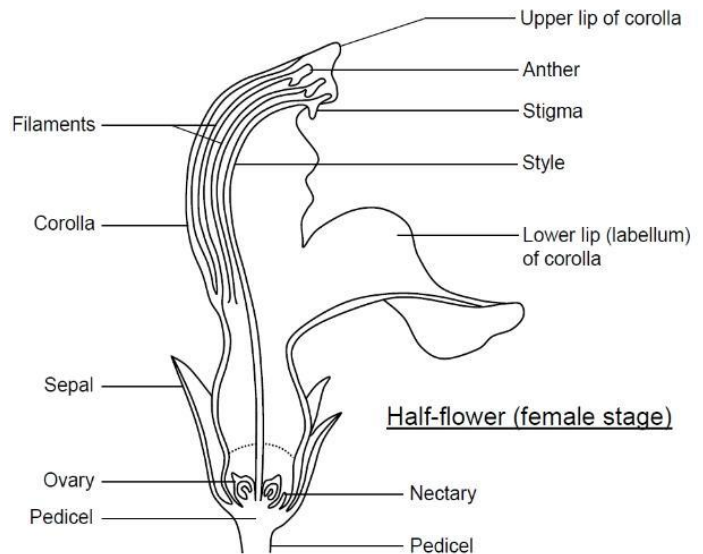
Show the economically important species of the family and identify 2-3 species with the help of identifiers, giving them a botanical description.

## REINFORCEMENT QUESTIONS:

1. What are the unique systematic features of the Gemini family?
2. Describe the series and species of the family that are cultivated as annual plants.
3. Show the types used in the pharmaceutical industry in our country.



White Deadnettle (*Lamium album*)



Salvia natans L.

Lamium album L.

32-picture

## PRACTICAL EXERCISE 18

**Topic: The tribe of Solanales.**

**Solanaceae family.**

**(2 hours).**

**Necessary materials:** herbarium specimens of plants such as potato (*Solanum tuberosum*), black sorghum (*Solanum nigrum*), tomato (*Solanum lycopersicum* or *Lycopersicon esculentum*), tobacco (*Nicotiana tabacum*), and datura stramonium. These are samples of flowers of plants fixed in alcohol.

**GENERAL CONCEPT:** The Solanaceae family belongs to the Solanales tribe and has 90 genera and 3000 species. There are 25 species belonging to 7 families in Uzbekistan. The representatives of the family are mainly perennial herbs, and in tropical regions, most of the representatives are creeping and have a small number of tree representatives. The leaves are simple, entire or leaflets are variously cut, without a side, arranged in a row on the stem. The flowers are single or clustered in an inflorescence, mostly actinomorphic, and in some

representatives, partially zygomorphic, and bisexual. Sepals [fused, five-toothed, persisting in fruit (tomato)], corollas and stamens 5 each. It has five stamens growing from the inner side of the tube. Anthers are mostly 2-celled. The seed is a syncarp and consists of two carpels. The top of the node, the fruit is a rezoar or pod.

Most representatives have a poisonous saloin alkaloid, which is widely used in medicine (mingdevona - Hyoscyamus; bangidevona - Datura, etc.). Some representatives are very important as vegetable crops (potato - Solanum tuberosum, tomato - Solanum lycopersicum or Lycopersicon esculentum, garimdori - Capsicum annuum, eggplant - Capsicum annuum, etc.) and are cultivated in large areas.

**TASKS:** 1. To study the representatives of the cultured and wild-growing species, to give a botanical description (for examples of species of the ituzum, mingdevona, garimdori and tobacco species).

2. The lifestyles of the studied species, the shape and location of the leaves, inflorescences, the general formula of the flowers, the type of fruit, and their economic significance are studied and drawn.

3. Identification of studied plants by means of detectors.

**PROCEDURE:** As an example, we can take a tomato plant, which is widely cultivated. The homeland of this plant is Peru. Tomato plant is an annual herb, 50-60 cm tall. Root system - tap root. The stem is upright, branched, and during the formation of the fruit, the stems begin to lie on the ground, and the rounded or pointed stems are hairy. Inflorescences are often small and have 3-20 flowers.

The flowers are straight (actinomorphic), the sepals are 5-10 green, they are attached from the bottom, and they grow again when the fruit is formed. Inflorescences are yellow, 5-10, pointed at the top, have twisted corollas, which are also joined at the bottom. Androeciums also have 5-10 stamens, stamens are 1-2 mm, and pollen grains are large, stamens are tightly packed together - forming a tube. Genetseyi - syncarp, node upper, 2 or many celled. The flower formula is as follows:

Sa (5-10) So (5-10) A5-10 G (2-10) The fruit is a fleshy berry, red, yellow, or even black in color.

At the end of the work, compare and record the signs of plants belonging to two different families (tomato and tobacco) (identify the differences in leaves, flowers and fruits).

### **REINFORCEMENT QUESTIONS:**

1. What is the Latin name of the Ituzumdosh family?
2. Describe the tomato plant?

3. Give examples of wild representatives of the Solanaceae family?  
4. Give examples of cultural representatives of the Solanaceae family?



**Nicotiana tabacum L.**



**Datura stramonium L.**



**Solanum nigrum L.**

33-picture

## PRACTICAL EXERCISE 19

### Topic: Asteraceae family (Asteraceae)

**Necessary materials:** herbarium specimens and flowers fixed in alcohol of plants such as sunflower (*Helianthus annuus*), taraxacum officinale (*Achillea millifolium*), cornflower (*Centaurea depressa*).

**GENERAL CONCEPT:** The family of sedums is extremely widespread and diverse in the angiosperm section, with about 20-25 thousand species in about 1300 genera.

Many species have characteristics of variability in relation to environmental conditions. The sedges are mainly herbaceous plants, some of them are shrubs, and in the mountainous areas of tropical regions, there are also shrubs and trees. Leaves are simple, sessile, entire or clipped. They are located in a row or opposite to the stem, sometimes in a row. A distinctive feature of the family is the basket-shaped inflorescences. Baskets often look like a single flower. If there are few baskets in some representatives, they are collected in a shield or hollow flower, and the baskets are surrounded by leaves. The flowers are very diverse, some are large and showy, and some are small, colorless and inconspicuous. The seed consists of 2 fruit leaves, the node is lower, the fruit is a pistachio.

1. Tubular petals grow together in the form of a tube, the upper part of the tube is widened, with five teeth, curved free petals. Flowers are actinomorphic, bisexual (flowers located in the middle of the sunflower basket), sometimes unisexual. Flower formula  $\square Sa(5)0 So(5) A(5) G(2)$

2. In the lower part of the tongue-shaped flower, there is a very small short tube, and the upper part is completed with 5 tongue-shaped teeth. The flower is zygomorphic, bisexual. An example of this can be taken as kaqiot, sachartqi.  $\uparrow S(5)0 So(5) A(5) G(2)$

3. Funnel-shaped flowers resemble tubular flowers in structure. The difference is that the corollas are funnel-shaped at the top of the tube. The number of teeth is more than 5. Flowers are asexual (does not have pollinators and seeds), such flowers are located on the edge of baskets (stalks).  $Sa(5)0 So(5-7) A0 G(0)$

4. False-lobed flowers are formed from 3 corollas, zygomorphic, often have seeds, for example, flowers around (the edge) of a sunflower basket. Flower formula  $\uparrow S(5)0 So(3) A0 G(2)$

On the basis of the above signs, sila are divided into 2 subfamilies: Naychaguldoshka (members of the group such as sunflower, boymodoron, olmasot, shuvok) and tilchaguldoshka (representatives of the family such as kakiot, sachartqi).

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PROCEDURE: 1. Typical representatives of the family are studied from the herbarium, in fixed or steam softened (evaporated) materials.

The life of the representatives of this family, the location of the leaves, whether they have sides, the location of the baskets on the flower branches, the position of the flower in different species and its structural features, the types of structure of the flower in the baskets, the type of fruit, the importance of its representatives in the economy (food, oil, fodder preparation, honey extraction and weeding) are taken into account. Then a steamed or fixed ball of a representative of this family is seen. It has a common enclosing tube or not, how it is structured, cut the flower to the length, what is the shape of the flower bed, whether it is smooth or covered with scales, what is the leaf of the calyx, whether the corolla grows separately or together, What is the shape (pipe-shaped, funnel-shaped, tongue-shaped, pseudo-tongue-shaped), how many corollas are formed is important. The tips of the petals are opened and spread out on the glass, whether the flower has androecium and gynoecium, the pollinators are separated with a pinna, how many pollinators are in the flower, whether the filaments of the pollinators grow separately or together, the top or bottom of the flower node. The knot is cut crosswise to determine how many nests it has.

The flower on the edge of the flower is studied based on this plan.

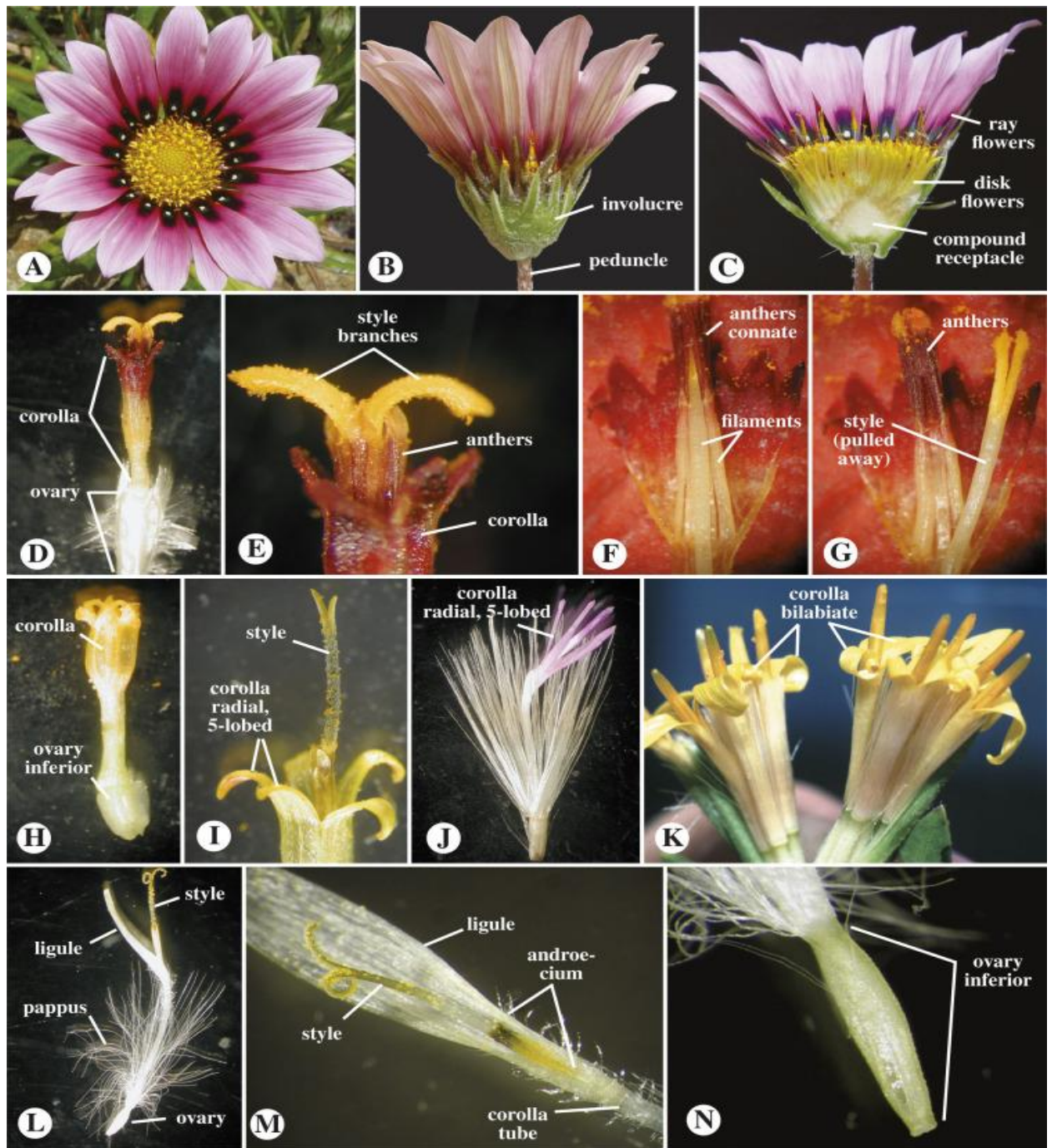
## REINFORCEMENT QUESTIONS:

1. What are the unique systematic features of the family of relatives?
2. What are the culturally cultivated species of the family, their botanical description and their importance in the national economy?
3. What are the characteristics of a family? Give examples of representatives of families.



34-picture. Asteraceae. A–D. Involucre morphology. A. Imbricate, multiseriate, isomorphic phyllaries in *Encelia californica*. B. Imbricate, multiseriate, dimorphic phyllaries in *Ursinia* sp. C. Mostly uniseriate phyllaries (but with tiny outer bracts below) in *Senecio vulgaris*. D. Decussate phyllaries in *Jaumea carnosa*. E–G. Secondary inflorescence types. E. Glomerule of heads in *Carduus pycnocephalus* (also having spine-tipped phyllaries). F. Corymb of heads in *Achillea* sp. G. Secund, narrow panicle of heads in *Solidago pinetorum*. H–J. Radiate heads, having inner disk flowers and peripheral ray flowers. H. *Aster* sp. I. *Layia platyglossa*. J. *Tithonia rotundifolia*. K–M. Ligulate heads, with all ray flowers. K. *Malacothrix californica*. L. *Cichorium intybus*, chicory. M. *Rafinesquia neo-mexicana*.





35-picture. Asteraceae. A–C. *Gazania* sp., head morphology. A. Radiate head, face view. B. Head, side view, showing involucre. C. Head, longitudinal section, showing compound receptacle, central disk flowers, and peripheral ray flowers. D–G. *Encelia californica*. D. Disk flower, showing inferior ovary and corolla. E. Flower apex. Note two-branched style and subtending anthers. F, G. Dissected flower, showing syngenesious androecium, with central style. H–J. Disk flower morphology. H. *Chrysanthemum coronarium*. I. *Bahiopsis laciniata*. J. *Carduus pycnocephalus*. K. Bilabiate flower morphology, *Trixis californica*. L–N. Ray flower morphology, *Sonchus oleraceus*.

## 20- PRACTICAL TRAINING

**Topic: Liliopsida or monocotyledons (Monocotyledonea) class. Familiarity with representatives of Liliidae class, Liliales tribe, Liliaceae family. Iridaceae (Iridaceae).**

**Necessary materials:** herbarium and living objects of species such as Tulipa and Lilium. In order to compare with representatives of other families, some representatives of the chuchmoma family (chuchmoma Amaryllis, narcissus - Narcissus).

**GENERAL CONCEPT:** The main reason why members of the Liliaceae or Monocotyledons (Liliosida) class are called Monocotyledons is that the stem has one cotyledon. The class has 3,100 genera and about 63,000 species, mainly annual, biennial, and perennial herbs, with a small number of trees (palm, yucca, dratsena), shrubs, and liana forms. Most representatives of this class have adapted to unfavorable conditions by forming rhizomes, bulbs, and tubers underground - geophytes, heliophytes adapted to grow in extreme humidity and swamps; they are xerophytes adapted to lack of moisture (drought) and ephemeroids that spend their development period in a short period of time.

The Lilianoma tribe has about 20 families, which are found in various ecological environments. Most representatives are perennial herbs. Flowers are large, light-colored, bisexual, mostly actinomorphic, 3-membered, arranged in 5 circles.

Cauliflower is simple, crown-shaped, only some representatives can be cup-shaped. Androecium consists of 6 free pistils, located in 2 circles out of 3. The gynoecium is a syncarp, consisting mainly of 3 carpels. The knot is 3-celled, top (except for the chuchmomadazakh and sapsardazakh family). The fruit is a pod, only in some representatives it is a berry. The leaves are entire, with parallel or arcuate veins.

Some species of this tribe are widely used in food, and some species are used medicinally or as ornamental plants.

Most of the species of the family of lilies belonging to this tribe (there are 500 species in 10 families, of which 70 species belonging to 4 families grow in Uzbekistan) are endemic plants, and some species are included in the "Red Book of Uzbekistan" included. There are a lot of species in the genera such as lily of the valley, lily of the valley, and lily of the valley, and they are widely distributed in desert, hill, mountain and pasture regions. Most representatives have rhizomes or bulbs. Gul Kurgan is located in two crown-like circles. For example, the flower formula of a tulip is:  $R_{3+3} A_{3+3} G_{(3)}$

**TASKS:** 1. familiarize yourself with the representatives of several species of the tulip family and give a full description of them.

2. Draw leaves, inflorescences, flowers and flower parts of the studied species.
3. Compare a species of the tulip family with a representative of the chuchmoma family (chuchmoma).
4. Identify 2-3 types of plants belonging to the family.

**PROCEDURE:** As an example, we can consider the red tulip (*Tulipa gregii*) plant. Red tulip is a perennial, herbaceous plant, 20-40 cm tall. In the lower part of the hilly and mountain regions of our republic, it is found in gray soil. There are yellow spots on the leaves.

Petals are golden-red, with a yellow black spot underneath. CHangchi threads are hairless. The flowers are solitary, the corolla is crown-shaped, colorful, there are 3 of them, and they are arranged in two circles. Stamens 6, Gynetsei syncarp, node upper, 3-pointed. The fruit is a pod. The studied plant parts are drawn based on the assignment. 2-3 types of the family are identified using identifiers.

At the end, the unique systematic features of the chuchmoma family are studied, a type is identified, and the systematic features are studied in comparison with a representative of the tulip family.

Iridaceae family. This family includes 1800 species belonging to 70-80 genera. They consist of perennial herbs with rhizomes, bulbs or root nodules. Representatives of the family can be found in all regions of the Earth. It is especially widespread in the tropics of Eurasia, the south of America, and the countries along the Mediterranean Sea. 30 species belonging to 6 families grow in Uzbekistan. The flowers are zygomorphic, bisexual, and the sepal consists of 6 lobes. The fruit is a pod with many seeds. There are about 300 species of lilies on Earth. Five types of gladioli (*Gladiolus*), crocus, iridodictyum and Juno are included in the "Red Book" of the Republic of Uzbekistan.

#### **REINFORCEMENT QUESTIONS:**

1. What are the characteristics of the Lolados family?
2. What species of the family do you know that are used for decoration and medicine?
3. Describe the categories and species included in the "Red Book" of Uzbekistan?
4. Name the characteristics of the class of monocotyledons?



*Tulipa micheliana* T. M. Hoog



*Tulipa korolkowii* Regel



*Tulipa lanata* Regel



*Tulipa ingens* T. M. Hoog



*Tulipa uzbekistanica* Botschantz. et Sharipov

36-picture.

## 21- PRACTICAL TRAINING

**Topic: The class of wheat harvesters. Poales tribe, wheat family (Poaceae).**

**Required materials:** Herbarium of representatives of genera such as Wheat (*Triticum*), Barley (*Hordeum*) and Maize (*Zea*), Rice (*Oryza*) (with complex spiky inflorescences). Herbarium of representatives of *Cyperus* and *Scirpus* from the Khiloldash family.

**OVERVIEW:** The genus Wheatear is a single family of the wheat family, with 900 genera containing approximately 11,000 species. They are diverse in structure and very common. At the same time, representatives of this family are of great importance in the national economy as food and fodder. Representatives of this family are annual, biennial and perennial grassy plants. Intercalary meristems are located on the basis of joint spacing and serve to increase the height of the stem. The leaves are simple, long ribbon-like and consist of sheaths and leaflets. The stipule at the transition point of the leaf blade is one of the systematic signs of this family. A ball is a complex spike or furrow. Underneath the spikes are deformed leaf spikelets.

Each flower is formed on the axis of the spike and has outer and inner pistils. The flowers are small, inconspicuous, mostly bisexual, only the representatives of the corn family have unisexual flowers. The rosette is reduced and has 2 sepals - lodicules. There are usually 3 threshers, sometimes 1-2 or 6 (in rice). The gynoecium is made of one, 2 carpels, the beak is feathery with two parts. The knot is top. The flower formula is  $R(2)+2A3G(2)$ . The fruit is a grain (in some representatives, it is accompanied by grain clusters, in representatives of the barley family). Some experts divide this family into 3 families.

Bombukdas, tariqads and konbirbassads. Representatives of the Panicoioeae family (corn, rice, sugar cane, sorghum, etc.) are annual or perennial grasses. Cereal crops such as wheat (*Triticum*), oats (*Avena*), barley (*Hordeum*) from the Poaeoideae family are important in the production of bread and bakery products.

**TASKS:** 1. Study various representatives of the wheat family and give them a botanical description.

2. Draw the leaf, inflorescence, spike, flower and flower parts of the plant of the studied species.

3. Compare the representatives of the wheat family with the representatives of the millet family and show their distinctive features (for example, wheat or ryegrass and rice or corn).

4. Study the different characteristics of representatives of the wheat family from representatives of the wheat family (for example, sallow and wild barley). Identify a species using the detector.

**PROCEDURE:** As an example, the characteristics of soft wheat (*Triticum aestivum*) and corn (*Zea mays*) or rice (*Oryza sativa*) are studied. The type of root system of plants of this family, the morphological features of the stem, the position of the leaves, their shape, and whether the sheath is open or closed are determined.

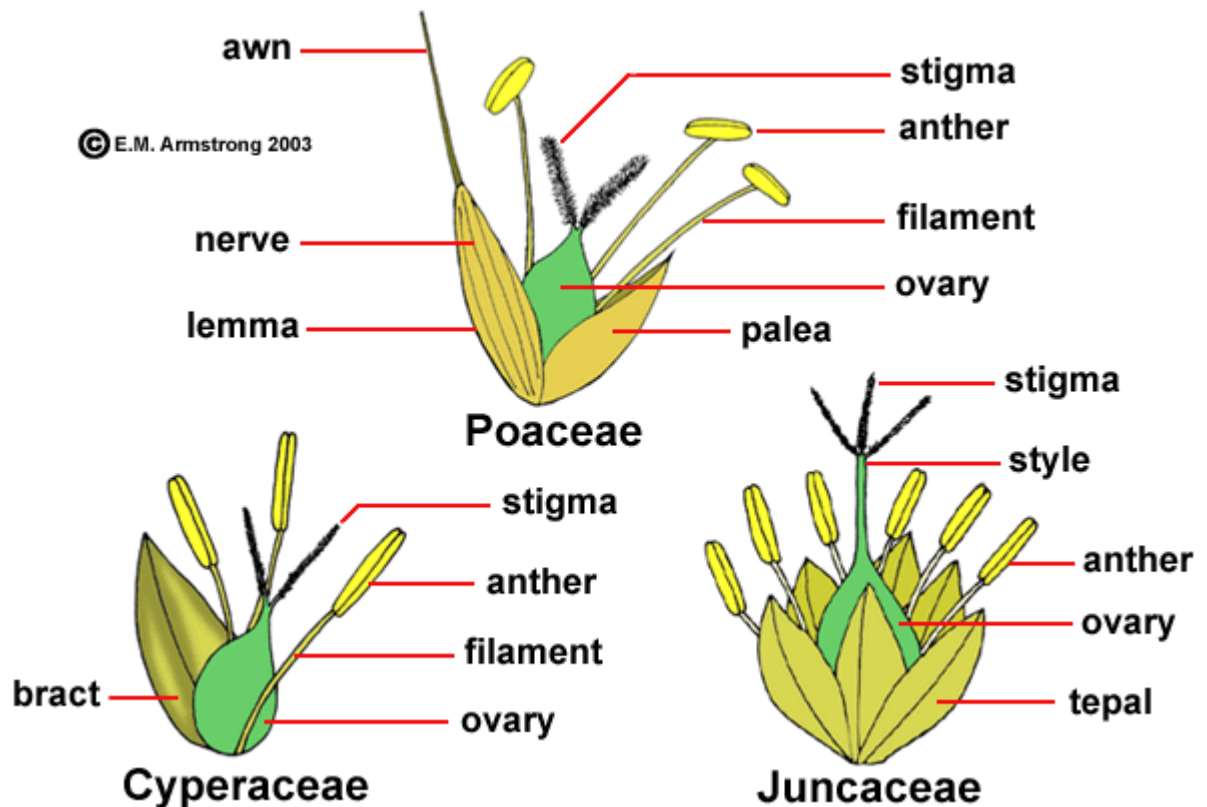
Attention is paid to the shape of the tongue and the type of the flower. A separate flower is separated from the spike, and the lower and upper flower petals are found. Their shape, number of spikes or no spikes, the length of the spikes, the location of the spikes, and the differences between the upper and lower grains of the ear are determined.

You can see the veil in the flower. It is determined how many pollinators are in the flower. Draw a diagram and schematic of the spike.

After studying the species, the members of the subfamily are compared and their distinctive features are shown. Then, the typical representative of the wheat family is compared with the representatives of the family of the wheat family, and the main systematic features of the family are described.

#### **REINFORCEMENT QUESTIONS:**

1. What are the unique systematic features of the wheat family?
2. What are the characteristics of the Khilalodash family and the wheat family?
3. What is the difference between the family members of the wheat family?
4. List the types of family used in the national economy and describe them.



37-picture. Flower structure in members of the Poaceae family

## 22- PRACTICAL TRAINING

**Topic:** Arecales tribe, Arecaceae family. Typhales tribe, Typhaceae family.

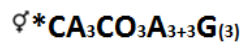
**Required materials:** Various permanent micropreparations. Herbariums, plant identifiers,

Pictures, tables, fictitious flowers, fruits, magnifier, tweezers, proporoval Nina and others.

**A tribe of Palmanamos (Arecales).** This tribe includes one family.

**Arecaceae family.** Among the monocots, only palms are tree-shaped. The stem is straight, columnar, evenly thickened, unbranched, sometimes bushy or liana-like. Palm leaves are very large, feathery. The flowers are quite large, and the fruits and seeds are also large. This family includes 3000 species belonging to 210 genera. They grow in tropical and subtropical regions. The height of palm trees is up to 60 meters, the width of the trunk is up to 1 m (the diameter of the stems of lianas is 2-3 cm, and the length is 200-300 m). The body is covered with beautiful leaf sheath remains. Large leaves are placed in a ball at the end. The leaves are sheathed, long-banded and have large plates, and are divided into feather-like or claw-like pieces. The flowers are unisexual (sometimes bisexual), actinomorphic, colorless, small. The length of the flower reaches up to 14 m in some species. Rose petals are usually arranged in 2 circles of 6, 3 of them. There are 6 or 3 wings, sometimes more. The seed is formed by the growth of 3 carpels. The fruit is a pod, wet fruit or nut. The fruit of some of them is very large, up to 1 m in circumference, and

weighs more than 25 kg. The seed is large and has a hard endosperm. Palms are of great economic importance in tropical and subtropical countries. The fruit of the coconut palm (*Cocos nucifera*) is used for food. Oil is extracted from the seeds of the oil palm (*Elaeis guineensis*). Wood is used as a building material. Date palm fruit (*Phoenix dactylifera*) contains about 70% sugar and is used as a nutritious food. We (among many countries) are planted and grown as ornamental plants (date palm - *Phoenix dactylifera*, Washington palm - *Washingtonia filifera*, Livistona - *Livistona chinensis*, etc.).



Flower formula:

**The tribe of Koganamos (Typhales).** This tribe includes 2 families.

**Typhaceae family.** This family includes perennial grasses up to 2 meters tall, growing in watery environments, especially swamps, with thick rhizomes. The stem is cylindrical, jointless, unbranched. The leaves are long, ribbon-like, located on 2 sides. The flowers are small, unisexual, without sepals, located in spike-like stalks. Seed flowers are located in the lower, thick part of the stalk, and pollinator flowers are located in the upper thin part. There is no rosette, long hairs have developed instead. Male flowers have 3 stamens, and the filaments grow together. The female flower consists of 1 carpel, the upper node is covered with single-celled, banded, thin, long hairs.

This family includes one genus, 15 species. It is widespread in the world. 6 species belonging to the genus *Typha* grow in Uzbekistan. They grow on the banks of rivers, lakes and swamps, in ditches. Types: Broad-leaved sorghum - *Typha latifolia*, Laxman's sorghum - *Typha laxmánnii*, Small sorghum - *Typha minima*, Thin-leaved sorghum - *Typha angustifolia*, Delicate sorghum - *Typha angustata*.

Baskets, mats, and bags are made from the leaves of koga, and starch can be obtained from the roots. The fluff in the stem is rich in cellulose.

*Typha latifolia*. Height—1–2 m, stem thickness—1–1.5 cm, width of pollinator flowers - 1–1.5 cm, width of seed flowers - 2–2.5 cm, dark brown ir. It blooms in July, the seeds ripen in August. It grows on the banks of rivers and lakes in hilly and mountainous areas, in swampy areas of streams.

Flower formula: male flower - \*Sa0So0A3G0, female flower - \*Sa0So0A0G1





38-picture. -*Typha angustifolia* L.

## 23- PRACTICAL TRAINING

### Topic: Study of life forms of plants (2 hours).

1. Plants can think about their life forms.
2. According to Raunkier's classification, he can divide plants into life forms.

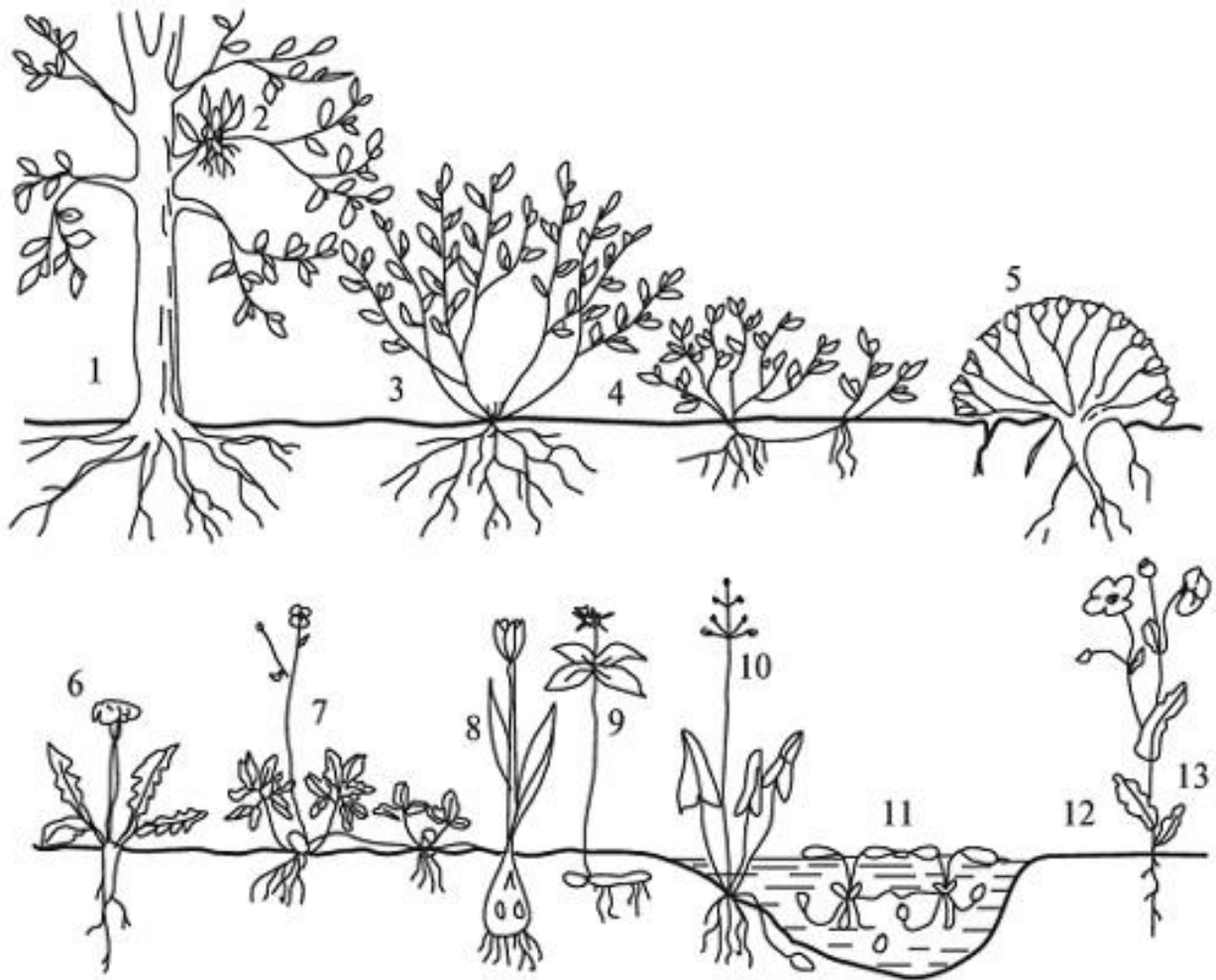
In the process of evolution, plants adapted to the external environment and acquired certain morphological and biological adaptive features. These adaptive characters create a certain appearance in the plant - habitus. This is called a biomorph or life form. Each life form has a certain appearance, it is characterized by physiological characteristics, speed of growth and development, ability to adapt to a certain environment.

There are several systems of life forms. Examples of these are the classifications of A. Humboldt (1807), Krasnov (1988), Pachosky (1921), Alyokhin (1936), Serebryakov (1962).

The most common of them is the system proposed by the Danish scientist K. Raunkier (1905). According to it, plants are divided into 5 groups

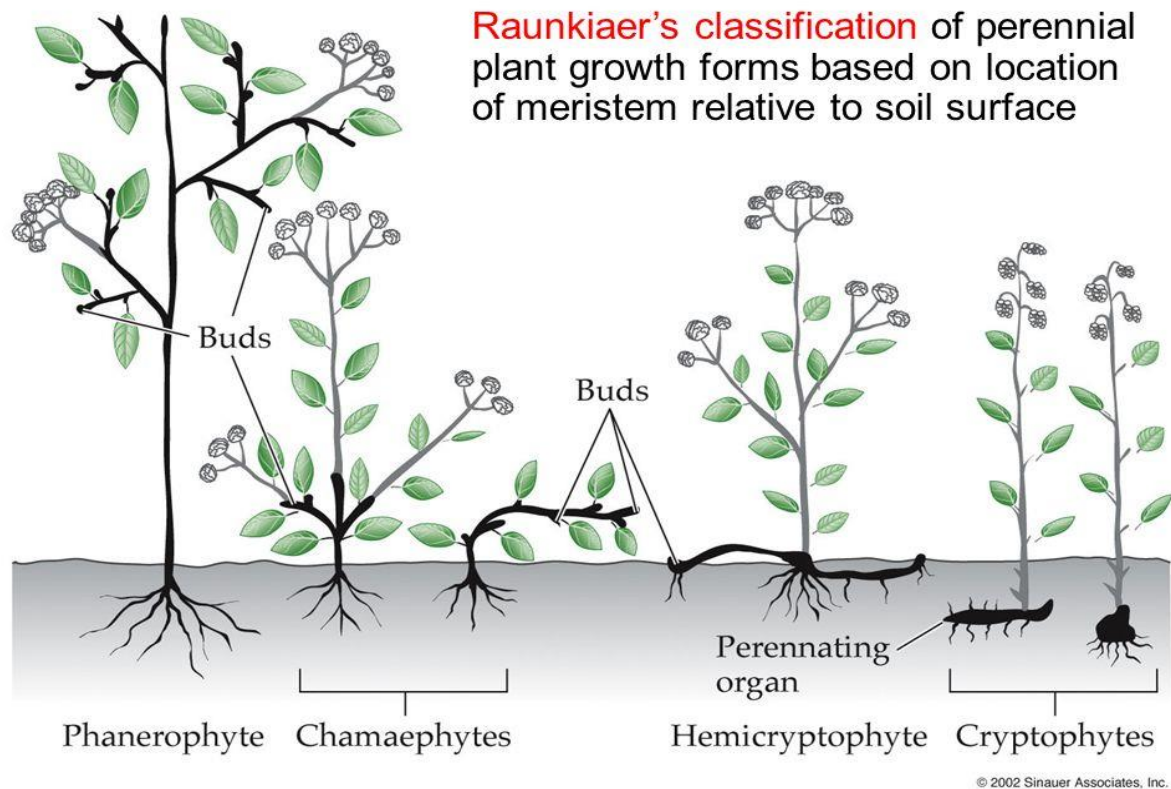
- Phanerophytes (R) — wintering buds are located 30 cm above the soil surface (tree, bush, lianas)
- Chamephytes (Ch) — plants with wintering buds 20-30 cm from the ground (shrubs and young bushes)
- Hemicryptophytes (N) are perennial grasses, the winter buds of which are stored on the surface of the earth.
- Cryptorphytes (K) — divided into 3 groups:

- a) Geophytes - wintering buds are placed in 2-5 cm of the soil on the rhizomes.
- b) Heliophytes are plants of marshes and ponds, the winter buds of which are in water.
- c) Hydrophytes are plants that float in water, and their wintering buds are located at the bottom of the water.
- Therophytes (Th) - annual herbs, whose seeds are stored in the soil. They spend an unfavorable period for the plant in the form of ypyg. This group includes ephemeral plants.



39-picture. System of life forms according to K. Raunkjer: 1-3 phanerophytes 4-5 chamephytes; 6-7 hemicryptophytes; 8-11 cryptophytes; 12-13 therophytes; 13th spilled seed.

The life forms of the plant are different in different climatic regions. The ratio of species to life forms in the region is called "biological spectrum". The location of the spectrum of plants on the earth by climatic regions is presented in 3 tables.



40-picture. Raunkiaer's classification

As can be seen from the table, phanerophytes are widespread mainly in the tropics. Hamephytes are more common in arctic regions, and therophytes are more common in desert and temperate regions.

Climatic regions	Life forms				
	R	Ch	N	K	Th
<b>Tropical</b>	<b>68</b>	<b>6</b>	<b>12</b>	<b>5</b>	<b>16</b>
<b>Desert</b>	<b>4</b>	<b>8</b>	<b>1</b>	<b>5</b>	<b>22</b>
<b>Mediterranean</b>	<b>12</b>	<b>6</b>	<b>29</b>	<b>11</b>	<b>42</b>
<b>Also 'field I</b>	<b>8</b>	<b>6</b>	<b>52</b>	<b>25</b>	<b>9</b>
<b>Arctic</b>	<b>1</b>	<b>22</b>	<b>60</b>	<b>15</b>	<b>2</b>

Russian scientist I. G. Serebryakov has a unique approach to systematizing the life forms of plants. He pays more attention to the above-ground part of plants.

I. G. Serebryakov (1962) proposes an ecological-morphological classification for flowering plants. According to it, plants are divided into 4 large groups:

- I. Woody plants (trees, shrubs and bushes);
- II. Herbaceous plants (one, two and perennial grasses);
- III. Intermediate, plants (shrubs and shrubs);

#### IV. Aquatic plants (floating, underwater and coastal plants).

The type of growth and duration of vegetation are taken into account when including plants in which group.

#### **Control questions:**

1. Phanerophytes include .....

- a) Trees, bushes, grasses, c) trees, bushes, algae
- s) Trees, shrubs, bushes, d) trees, shrubs, rhizome plants

2. Plants are divided according to the ecological and morphological system.

- a) Trees, bushes and shrubs
- c) One, two and perennial grasses
- s) To undergrowth and undergrowth
- d) To all of the above

3. Hydrophytes include .....

- a) Plants floating in water
- c) Swamp plants
- S) plants living by the water
- d) Small plants living in water.