

**Assessment tools for certification  
in the discipline "Botany"  
for students of the educational program  
Specialist  
in the specialty 33.05.01 Pharmacy,  
form of study full-time education  
for the 2023-2024 academic year**

Intermediate certification in the discipline "Botany" is conducted in the form of an exam. The exam is held in three stages. At the first stage, students are tested to assess the basic mastering of the discipline. For this purpose, the department of the discipline "Botany" developed 10 variants of tests, including 100 test tasks.

Then the students' mastering of practical skills is checked. Checking the mastering of practical skills is carried out on separate tickets. Each ticket includes identification of 5 species of proposed plants by herbarium and 1 microdrug from the list of evaluation means for intermediate certification.

The third stage is an interview on theoretical questions and is conducted on tickets. Each ticket includes three theoretical questions from the list of questions for the exam, some of which are submitted for independent study in the process of mastering the discipline, so the tickets can be used to assess the student's independent work, assessment of the formation of skills in the use of information technology and assessment of the formation of professional competencies.

Assessment tools for interim certification in the discipline

**Examples of test tasks:**

1. Which of the following families is characterized by dicotyledonousness:

- a) Nettles;
- b) Primrose;
- c) Malvae.

2. Representatives of the Violet family have

- a) five-membered;
- b) four-membered;
- c) three-membered;
- d) two-membered.

3. Members of the cruciferous family have fruits that are

- a) monocarpic;
- b) apocarpic;
- c) cenocarpic;
- d) pseudomonocarpic.

4. The apple fruit is formed by

- a) exocarpy, mesocarpy from the hypanthium, endocarpy from the ovary;
- b) exocarpy from the hypanthium, mesocarpy and endocarpy from the ovary;
- c) exocarp from hypanthium, mesocarp from peduncle, endocarp from ovary.

5. Leaves of Umbrellas:

- a) simple, without leaflets, with a raceme;
- b) simple, without leaflets with sheaths;
- c) complex with sheaths.

6. Zygomorphic flower

- a) has one axis of symmetry;
- b) has many axes of symmetry;
- c) has no single axis of symmetry.

7. A root system consisting of adventitious roots is called a) tap root; b) has many axes of symmetry; c) has no axis of symmetry.

- a) rod;
- b) lobe;
- c) mixed.

8. Metamorphosed underground, less often above-ground shoots are

- a) rhizome;
- b) tuber;
- c) cauliflower;
- d) bulb.

9. The primary cortex of a stem consists of

- a) epidermis, collenchyma, assimilating parenchyma, endodermis;
- b) epidermis, periderm, collenchyma, assimilating parenchyma, endoderm;
- c) epidermis, collenchyma, assimilating parenchyma, endodermis, pericycle;
- d) collenchyma, assimilating parenchyma, endoderm.

10. The isolateral leaflet is distinguished from the dorsoventral leaflet by

- a) by the presence of homogeneous mesophyll;
- b) by the presence of a large amount of chlorophyll in the spongy and columnar parenchyma;
- c) by the presence of spongy and columnar parenchyma.

**Examples of tasks to assess the mastering of practical skills:**

1. Name the plants of the herbarium in Russian and Latin. Determine what order and family they belong to.

2. Name the microdrug N1. Specify its anatomical features.

List of questions for the interview

<b>№</b>	<b>Task text</b>	<b>Competences to be checked</b>			<b>Labour function of the vocational standard "Pharmacist", to the formation of which contributes discipline</b>
1.	Botany as biological science. The main stages in the development of botany.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
2.	Divisions of botany and their relation to system organisation in living nature (cellular, tissue, organism, organismal, population-species level).	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
3.	Plants as a source of medicinal raw materials. The importance of botany to pharmacy.	<b>1, 5, 8</b>	<b>1, 2,5,7,</b>	<b>14, 21,22</b>	A/02.7, A/04.7
4.	Peculiarities of the structure of the plant cell. Protoplast and its derivatives.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
5.	Cytoplasm. Chemical composition and physical state.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
6.	Structure and function of the elementary membrane. Plasmalemma and tonoplast.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
7.	Structure and functions of cell organoids: endoplasmic reticulum, Golgi complex, lysosomes, ribosomes, microtubules.	<b>1, 5, 8</b>	<b>1, 2,5,7, 9</b>	<b>21,22</b>	A/02.7, A/04.7
8.	Structure and functions of semi-autonomous cell structures: mitochondria, their structure, role in energy processes.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
9.	Structure and functions of semi-autonomous cell structures: plastids, types of plastids, plastid pigments. Submicroscopic structure of chloroplast.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
10.	Nucleus, structure and basic functions.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7

11.	Indirect cell division is mitosis.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
12.	Vacuole. Composition of cell sap. Functions of the vacuole. Osmotic properties of the cell.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
13.	Cell wall. Primary and secondary structure of the cell wall. Odontization, proboscence, cutinization. Cell wall pores. Cystoliths.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
14.	Stored nutrients: carbohydrates, proteins, fats, their detection reactions. Role of proteins, fats and carbohydrates in cellular life. Importance of stored nutrients for pharmacy and medicine.	1, 5, 8	1, 2,5,7,9	14, 21,22	A/02.7, A/04.7
15.	Secretory substances, their biological significance. The use of secretory substances in pharmacy for the diagnosis of plant raw materials.	1, 5, 8	1, 2,5,7,9	14, 21,22	A/02.7, A/04.7
16.	Cellular inclusions. Types of cellular inclusions in the plant cell. Their functions.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
17.	The fundamental differences between plant, fungal and animal cells.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
18.	The concept of plant tissue. Principles of classification of plant tissues.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
19.	Meristem tissues. Features of meristem cell structure. Functions of meristems.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
20.	Classification of meristems according to origin and localisation in the plant body.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
21.	Covering tissues, their classification, peculiarities of structure and function.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
22.	Primary covering tissue - epidermis, its structure and functions. Cuticle.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
23.	Trichomes, their types. Emergens.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
24.	Stomata, their structure and	1, 5, 8	1,	21,22	A/02.7, A/04.7

	mechanism of operation. Types of stomata of monocotyledonous and		<b>2,5,7,9</b>		
	dicotyledonous plants, their importance for diagnostics of medicinal herbs.				
25.	The primary root covering tissue, the rhizoderm, and its structure related to its function.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
26.	Secondary covering tissue - periderm, its formation and structure. Lenticels, their structure and functions.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
27.	Crust formation and structure.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
28.	Conductive tissues, classification, structure, functions. Peculiarities of movement of substances through xylem and phloem.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
29.	Xylem. Origin, functions. Elements of xylem, their types and structure.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
30.	Phloem. Origin, functions. Elements of phloem, their types and structure.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
31.	The conductive bundles, their types, location in the various organs of the plant.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
32.	A group of mechanical tissues. General characteristics and functions. Peculiarities of cell structure, placement in the plant body. Classification of mechanical tissues.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
33.	Collenchyma, types of collenchyma. Peculiarities of structure and localisation.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7
34.	Sclerenchyma, general characteristics, properties, varieties.	<b>1, 5, 8</b>	<b>1, 2,5,7,9</b>	<b>21,22</b>	A/02.7, A/04.7

35.	Basic tissues, classification, origin, localisation in the plant body, peculiarities of structure and function.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
36.	General characteristics, classification and function of secretory tissues.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
37.	Structure and functions of external secretory structures. Application of plant secretion products in medicine and national economy.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
38.	Structure and function internal secretory structures. Application of products of plant secretions of plants in medicine and national economy.	1, 5, 8	1, 2,5,7,9	21,22	A/02.7, A/04.7
39.	Vegetative and reproductive organs of higher plants. Symmetry, polarity, metamerics.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
40.	Similar and homologous organs. Examples.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
41.	The shoot. Structure of the shoot. Branching of the shoot. Leaf formation. Leaf mosaic.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
42.	The position of the shoots in space. Specialisation and metamorphosis of the shoots.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
43.	The bud and its structure. Structure of the cone of the stem (theory of tunica and corpus).	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
44.	Classification of the buds (open and closed, lateral and apical, dormant, adventitious, vegetative, generative and mixed).	1, 5, 8, 9	1, 2,5,7	21,22	A/02.7, A/04.7
45.	The stem. Functions of the stem. Anatomical structure of the herbaceous stem.	1, 5, 8, 9	1, 2,5,7	21,22	A/02.7, A/04.7
46.	Stem structure of a monocotyledonous herbaceous plant.	1, 5, 8,9	1, 2,5,7	21,22	A/02.7, A/04.7

47.	Stem structure of a dicotyledonous herbaceous plant.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
48.	Differences in the anatomical structure of the stem in monocotyledonous and dicotyledonous plants	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
49.	Transition to the secondary Stem structure. Types of cambium formation.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
50.	Secondary stem structure of woody dicotyledonous plants.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
51.	The secondary structure of the stem of coniferous plants.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
52.	Differences in the anatomical structure of woody dicotyledonous and coniferous plants.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
53.	The leaf is the vegetative organ of a plant. The main parts of the leaf.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
54.	Morphological classification of leaves.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
55.	Metamorphosis of the leaf and its parts.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
56.	Anatomical structure of the leaf in relation to its functions.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
57.	Classification of leaves according to their anatomical structure.	<b>1, 5, 8, 9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
58.	Anatomical structure of the dorsoventral leaf.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
59.	Anatomical structure of the isolateral leaf.	<b>1, 5, 8, 9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
60.	The anatomical structure of the leaf of coniferous plants.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
61.	The root is the axial organ of the plant. Functions, growth, branching. Types of roots. Types of root systems.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
62.	Root specialisation and metamorphosis.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

63.	Root zones. Structure of the root growth cone. Root cap. Features of the structure of the root in the different zones.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
64.	Primary anatomical structure of the root.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
65.	Differences in the primary structure of monocotyledonous and dicotyledonous plants.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
66.	Transition of the primary of the root structure to the secondary structure.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
67.	Secondary structure of the root of a herbaceous dicotyledonous plant.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
68.	The secondary structure of the root of a woody dicotyledonous plant.	<b>1, 5, 8,9</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
69.	Plant growth and development. General growth patterns.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
70.	Plant development. The stages of plant ontogenesis.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
71.	Internal and external factors affecting growth and development. The interaction between growth and development.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
72.	Plant systematics. Objectives of modern systematics. The main sections of systematics. Taxonomic categories and taxa. Binary nomenclature.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
73.	General characteristics Fungi. Structure of the fungal cell.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7
74.	Division of True Fungi. Features of their structure, mode of feeding. Types of reproduction. Classification.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7



75.	Class Zygomycetes. Systematic position. Peculiarities of development and reproduction by the example of Mucor.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7
76.	General characteristics and systematics of the class Ascomycetes. Sexless reproduction and sexual reproduction. Main representatives, applications in medicine. Ergot, cycle of life.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7
77.	Class Basidiomycetes. General characteristics. Peculiarities of developmental biology. Edible and toxic mushrooms .	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7
78.	The symbiotic nature of lichens. Reproduction. Basic principles of classification. Role of Lichens in nature and their use in medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
79.	General characteristics of the kingdom Plants. Origin of plants.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
80.	Lower plants. Algae. Ecological and morphological classification of algae.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7
81.	Red algae sub-kingdom . General characteristics. Peculiarities of the life cycle. Importance of red algae in nature and human life	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
82.	Sub-kingdom True algae. General characteristics. Classification of true algae.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

83.	Division of Green algae. Classification. General characterisation and biology of reproduction using the main representatives of the division (Chlamydomonas, Wolvox, Chlorella, Spirogyra). Significance of green algae.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7
84.	Division Diatom algae (Bacillariophyceae). General characteristics of the division. Cell structure of diatoms. Reproduction. Distribution. Role of Diatoms in nature.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
85.	General characteristics of the Brown Algae Division (Phaeophyceae). Main features of the anatomical structure of the pyloid. Main representatives of brown algae (Laminaria). Use in medicine and pharmacy.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
86.	General description of the sub-kingdom Higher Plants (Embryophyta). Origin of higher plants. Peculiarities of air habitat. Features of the structure of reproduction organs. The main divisions of higher plants.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
87.	Division Mosses (Bryophyta). General characteristics of the department. Classification. Role of mosses in nature and their use by humans.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
88.	Hepaticopsida, their characterisation, developmental cycle and alternation of generations in the example of Marchansia multiforme.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

89.	The main representatives of of the class Leafy Mosses (Bryópsida): Bryidae, Sphagnidae.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
90.	The cycle of development and alternation of generations on the The example of the moss Cuckoo Flax.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
91.	Division Lycopodióphyta. General characteristic of the modern Lycopodióphyta species. Medical use.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
92.	The developmental cycle of of Lycopodióphyta, using the example of Licopodium clavatum.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
93.	Division Equisetophyta. General characteristics of the main representatives of the division. Medical significance of Equisetophyta.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
94.	The life cycle of Equisetophyta as exemplified by Equisétum arvéense	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
95.	Division Polypodióphyta. General characteristics of the department. Use of Polypodióphyta in medicine.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
96.	Generational succession and nuclear phase change in the developmental cycle of Polypodióphyta as exemplified by Dryópteris filix-mas.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
97.	General characteristics of Seed plants. Appearance of seed, its biological significance.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
98.	Characteristics of the Gymnospérmae division, their origin. Progressive traits that emerged in the course of evolution.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7

99.	The life cycle of gymnosperms using <i>Pinus sylvestris</i> as an example .	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
100.	Classes of modern gymnospermae.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
101.	The main orders of the class Conifers. Importance in national economy and medicine.	1, 5, 8	1, 2,5,7	14, 21,22	A/02.7, A/04.7
102.	General characteristic of the Division of Magnoliophyta. The origin of the Magnoliophyta. Progressive changes in Reproductive and vegetative spheres compared to Gymnospermae.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
103.	A flower. Theories The origin of the flower.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
104.	Flower morphology. Leaf and stem Flower parts. Symmetry flower.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
105.	Structure, function and biological role biological role of the sterile parts of the flower: sepals, petals.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
106.	Structure and function of the fertile parts of the flower. Androceum. Structure of stamen. Pollen and its structure.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
107.	Structure and functions of the fertile parts of the flower. Gynoecium. Structure of the pistil. Types of gynaecium. Position of the ovary in the flower. Structure of the ovary.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
108.	Formula and flower diagram.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
109.	Progressive and primitive features of the flower. Examples.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
110.	Inflorescence. Structural elements of inflorescences. Biological role of inflorescences.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
111.	Classification of inflorescences.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7

112.	The nature of pollination. Self-pollination and cross-pollination. Types of cross-pollination. Adaptations to prevent self-pollination. Claytogamy.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
113.	Double fertilisation and its essence. The importance of double fertilisation for the prosperity of the Magnoliophyta.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
114.	The seed. Structure of the seed of Magnoliophyta. Seeds of monocotyledonous and dicotyledonous plants. of monocotyledonous and dicotyledonous plants.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
115.	Fruits. Structure of the fruit. Principles of fruit classification.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
116.	Classification of fruits, based on the structure of the gynaecium. Examples.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
117.	Distribution of fruits and seeds.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
118.	Classification modern Magnoliophyta.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
119.	Class Dicotyledonous. General characteristics of the class. Characteristics inherent to members of the class Dicotyledons.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
120.	Class monocotyledonous. General characteristics of the class. Characteristics, inherent to representatives of Monocotyledonous.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
121.	The main differences between members of the Dicotyledonous and Monocotyledonous classes.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
122.	Subclass Magnoliidae. General characteristics family Magnoliaceae (order Magnoliales). Main representatives, their significance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

123.	Subclass Magnoliidae. General characteristics family Schisandraceae (order Illiciales). Main representatives, their significance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
124.	Subclass Magnoliidae. General characteristic of the family Lauraceae (order Laurales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
125.	Subclass Magnoliidae. General characteristics of the family Nymphaeaceae (order Nymphaeales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
126.	Subclass Ranunculidae. General characteristics family Barbaricaceae (order Ranunculales ). Main representatives, Their significance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7
127.	Subclass Ranunculidae. General characteristics family Ranunculaceae (order Ranunculales ). Main representatives, Their significance in nature and medicine. medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7
128.	Subclass Ranunculidae. General characteristics family of Papaveraceae (order Papaverales ). Main representatives, their significance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7
129.	Subclass Caryophyllidae. General characteristic of the family Caryophyllaceae (order Caryophyllales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

130.	Subclass Caryophyllidae. General characteristic of the family Chenopodioideae (order Caryophyllales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
131.	Subclass Caryophyllidae. General characteristics of the family Polygonaceae (order Polygonales). Main representatives, their importance in nature, national economy and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
132.	Subclass Gamamelididae. General description of the family Fagaceae (order Fagales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
133.	Subclass Gamamelididae. General characteristic of the family Betulaceae (order Fagales). The main representatives, their national economic importance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
134.	Subclass Dilleenidae. General description of the family Theaceae (order Theales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
135.	Subclass Dilleenidae. General characteristic of the family Clusiaceae (order Theales). Main representatives, Their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

136.	Subclass Dilleenidae. General characteristic of the family Passifloraceae (order Violales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
137.	Subclass Dilleenidae. General characteristics of the family Violaceae (order Violales). Main representatives, their significance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
138.	Subclass Dilleenidae. General description of the family Cucurbitaceae (order Cucurbitales). Main representatives, Their importance in national economy and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
139.	Subclass Dilleenidae. General characteristics of the family Malvaceae (order Malvales). Main representatives, their significance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
140.	Subclass Dilleenidae. General characteristics of the family Brassicaceae (order Caperales). Main representatives, their economic and medicinal importance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
141.	Subclass Dilleenidae. General characteristic of the family Salicaceae (order Salicales). Main representatives, their importance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
142.	Subclass Dilleenidae. General characteristic of the family Ericaceae (order Ericales). The main representatives, their importance in nature, medicine, economy.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7



143.	Subclass Dilleenidae. General description of the family Primuláceae (order Primuláles). Main representatives, their importance in nature and medicine	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
144.	Subclass Dilleenidae. General characteristic of the family Urticaceae (order Urticales). Main representatives, their importance in medicine and pharmacognosy.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
145.	Subclass Rosidae. General characteristics of the family Rosaceae (order Rosales). Main representatives, their importance in national economy and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
146.	Subclass Rosidae. General characteristics of the family Fabaceae (order Fabales). The main representatives, their importance in agriculture and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
147.	Subclass Rosidae. General characteristics of the family Myrtaceae (order Myrtales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
148.	Subclass Rosidae. General characteristic of the family Onagraceae (order Myrtales). Main representatives, their importance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
149.	Subclass Rosidae. General description of the family Anacardiáceae (order Rutales). Main representatives, their importance in medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

150.	Subclass Rosidae. General characteristics of the family Rutaceae (order Rurales). Main representatives, their importance	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
151.	Subclass Rosidae. General characteristic of the family Hippocastanaceae (order Sapindales). Main representatives, their importance in medicine and national economy.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
152.	Subclass Rosidae. General characteristic of the family Linaceae (order Linales). Main representatives, their importance. In nature, national economy and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
153.	Subclass Rosidae. General description of the family Rhamnaceae (order Rhamnales). Main representatives, their importance in medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
154.	Subclass Rosidae. General description of the family Elaeagnaceae (order Elaeagnales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
155.	Subclass Rosidae. General characteristics of the family Araliaceae (order Araliales). Main representatives, their importance in medicine and the economy.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
156.	Subclass Rosidae. General characteristics of the family Valerianaceae (order Dipsacales). Main representatives, their importance in the national economy and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

157.	Subclass Rosidae. General characteristic of the family Apiáceae (order Araliales). Main representatives, their importance in national economy and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
158.	Subclass Lamiidae. General characteristic of the family Loganiaceae (order Gentianales). Main representatives, their importance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
159.	Subclass Lamiidae. General characteristic of the family Rubiaceae (order Gentianales). Main representatives, their importance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
160.	Subclass Lamiidae. General characteristic of the family Apocynaceae (order Gentianales). Main representatives, their importance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
161.	Subclass Lamiidae. General characteristic of the family Asclepiadáceae (order Gentianales). Main representatives, their importance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
162.	Subclass Lamiidae. General characteristics of the family Gentianaceae (order Gentianales). Main representatives, their importance in nature, medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
163.	Subclass Lamiidae. General characteristic of the family Menyantháceae (order Gentianales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

164.	Subclass Lamiidae. General characteristics of the family Solanaceae (order Solanales). Main representatives, their significance in medicine and agriculture.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
165.	Subclass Lamiidae. General characteristics of the family Polemoniaceae (order Polemoniales). Main representatives, their importance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
166.	Subclass Lamiidae. General description of the family Boraginaceae (order Boraginales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
167.	Subclass Lamiidae. General characteristic of the family Scrophulariaceae (order Scrophulariales). Main representatives, their importance in nature and medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
168.	Subclass Lamiidae. General characteristic of the family Plantaginaceae (order Scrophulariales). Main representatives, their importance in medicine	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
169.	Subclass Lamiidae. General description of the family Lamiaceae (order Lamiales). Main representatives, their importance in medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
170.	Subclass Asteridae. General description of the family Asteraceae (order Asterales). Main representatives, their importance in medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

171.	Subclass Lilidae. General characteristics of the family Liliaceae (order Liliales). Main representatives, their importance in medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
172.	Subclass Lilidae. General characteristics of the family Alliaceae (order Amaryllidales). Main representatives, Their importance in national economy and medicine	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
173.	Subclass Lilies. General description of the family Amaryllidaceae (order Amaryllidales). Main representatives, their importance in medicine.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
174.	Subclass Lilidae. General characteristics of the family Asparagaceae (order Asparagales). Main representatives, their significance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
175.	Subclass Lilidae. General characteristics of the family Convalariaceae (order Asparagales). Main representatives, their significance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>14, 21,22</b>	A/02.7, A/04.7
176.	Subclass Lilidae. General characteristics family Dioscoreaceae (order Dioscoreales). Main representatives, their significance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
177.	Subclass Lilidae. General characteristics Family Poaceae (Order Poales). Main representatives, their importance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7
178.	Subclass Lilidae. General description of the family Cyperaceae (order Cyperales). Main representatives, their significance.	<b>1, 5, 8</b>	<b>1, 2,5,7</b>	<b>21,22</b>	A/02.7, A/04.7

179.	Subclass Arecidae. General family characteristic Araceae (order Arales). Main representatives, their importance.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
180.	Subclass Arecidae. General Characteristics of the Areacacea family (order Arecales). Main representatives, their importance.	1, 5, 8	1, 2,5,7	21,22	A/02.7, A/04.7
<b>As a result, there is an opportunity to to control the level of theoretical training required by the following general list of competencies of FSES VO for the specialty 33.05.01 Pharmacy (specialist) and job functions of the professional standard "Pharmacist"</b>		1, 5, 8	1, 2,5,7,9	14, 21,22	A/02.7, A/04.7

### EXAMINATION TICKET (example)

1. Botany as a biological science. The main stages of development of botany.
2. Classification of leaves according to their anatomical structure.
3. The subclass Magnoliidae. General characteristic of the family Magnoliaceae (order Magnoliaceae). The main representatives, their importance in nature and medicine.

The full fund of assessment tools for discipline / practice is available in the EIES of VolgSMU at the link:

<https://elearning.volgmed.ru/course/view.php?id=4752/>

Considered at the meeting of the department of Pharmacognosy and Botany "26" May 2023, protocol No10

Head of the Department  
of Pharmacognosy  
and Botany, Associate Professor



Yanitskaya A.V.