Ministry of Health of Ukraine
Bogomolets National Medical University
The Faculty of Pharmacy
Department of Pharmacognosy and Botany

WORKBOOK
FOR INDEPENDENT WORK OF STUDENTS IN RESOURCE SCIENCE OF MEDICINAL PLANTS

(CLASSROOM AND OUT OF CLASS)
STUDY MANUAL

Surname, name of student _____

Course _____

Group _____

Kyiv – 2024

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The work book is created for optimizing the student’s studying during practical lessons of the subject «Study of medicinal plants resources». The work book is for students of full-time and part-time departments of pharmaceutical faculty who study the specialty «pharmacy» and for improvement of the knowledge control.

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INTRODUCTION

The course «Study of medical plants resources» as an important component of pharmaceutical disciplines on the one hand is a continuation and final stage of botanical education of pharmacist, on the other hand is a basic discipline for pharmacognosy because creating new effective herbal remedies and their introduction into medical practice is impossible without studying relevant resource base.

Researching the variety of medicinal plants as a source of medical plants resources is provided all around the world but their direction and nature are different depending on the country. These differences are related to the features of the economy of a country, it's traditions, plants resources wealth, avaliability and cultivation of area.

Materials published in the workbook are aimed to familiarize future specialists with international priorities in the field of education, use and protection of medicinal plants, participation of Ukraine in the global market of herbal remedies and substances. Structure of materials complies the curriculum. Additions provide information materials for students to perform tasks for some topics.

The original materials of the work book «Study of medical plants resources. Medicinal plants» (2014), the additions to Ukrainian Pharmacopeia and Ukrainian State register of medicinal products were used to create this work book.

CONTENT

TOPIC 1.

The basic concepts and content of researching of the resources of medical plants. Terminology and basic definitions.

Purpose: to learn the basic concepts of «Study of medical plants resources».

to know: the main terms and definitions of this discipline.

to be able to: give the definition and basic concepts; identify impurities to a medicinal plants.

Educational objectives

Task 1. Process the details of the terms and basic concepts.

Task 2. Find out the common features pharmacognostic terms and concepts that are similar to botanical.

Pharmacognostic terms:

Herb _____

_____

_____

Leafs _____

_____

_____

_____

Bark_____

_____

_____

_____

Roots and **rhizomes** _____

_____

_____

_____

Roots _____

_____

_____

_____

Flowers _____

_____

_____

_____

Fruits _____

_____

_____

_____

Seeds _____

_____

_____

_____

_____

Task 3. Give examples of medicinal plants species, which are raw roots, rhizomes and roots, grass, bark, leaves, fruits, flowers, buds.

Morphological group	Name of medical plants
Roots	
Rhizomes	
Roots and rhizomes	
Herb	
Leafs	

Fruits and seeds	
Flowers	
Buds	

Task 4. Write the definition of key terms and concepts.

Biological reserve of the raw

_____

_____

_____

Exploitative reserve of the raw

_____

_____

_____

The amount acceptable annual usage

_____

_____

_____

_____

Density of the reserve of raw materials is a

_____

_____

Harvest (crop)

_____

_____

Crop capacity

_____

Productivity

Accounting plot

Profusion

Projective cover

Special use of natural plant resources

Die of plants raw

Task 5. To make in the protocol a general list of plants of official medicine and associated species that may be impurities in the collection raw material.

Signature of teacher _____

PRACTICE TESTS

1. Choose the object of study of medicinal plants resources
a. Flora
b. Greenery
c. Species of medicinal plants and fungi
d. Phytocenosis
e. Ecosystem

2. As medicinal plants are called:
a. Whole plants or their parts, which can be used directly or after handling
b. Plant species which contains bioactive substances and are used or can be used in medicine
c. Dried grinded plants which can be used further for different purposes
d. Plant species which are used only in phytotherapy
e. Plant species which are used in food industry

3. Arrangement of limits of plant kingdom natural resources use is carried out for a term of:
a. 1 year
b. 2-3 years
c. 4-5 years
d. 5 years
e. 5-10 years

4. Part of division of useful resources value by period of a raw species population renewal is called:
a. Limit of use of medicinal plant
b. Acceptable volume of annual use
c. Producing capacity
d. Special use of natural medicinal plants
e. Density of raw reserve

5. Amount of a raw mass produced by plants per unit area over a given time:
a. Crop yield
b. Stocking rate
c. Raw produce
d. Producing capacity
e. Layering

6. Historically formed plants group having an area with the uniform type of soil and climatic conditions is:
a. Greenery
b. Flora
c. Biotope
d. Association
e. Phytocenosis

7. Which specimens of medicinal plants (MP) do not refer to the raw materials?
a. Mature reproductive parts of MP
b. Not damaged by pests specimens of MP
c. Half-grown specimens of MP
d. Fertile specimens of MP

21. The object of medicinal plants resource management is:
a. Animals and fungi
b. Synthetic compounds, plants and fungi
c. Minerals and plants
d. Plants and fungi
e. All above

22. *Medicinal plants include species which:
a. Are used in phytotherapy
b. Are used for medicinal products preparation
c. Are used in dietology
d. Are used in landscape gardening
e. Contain bioactive substances and are used or can be used in medicine

23. Leafy shoots of herbaceous plants are called … in resource management
a. Flowers
b. Grass
c. Shoots
d. Stem
e. Blooming grass

24. *Special use of natural herbal resources is carried out:
a. Taking into consideration only raw harvest guidelines
b. Using special license
c. For a fee
d. Without a fee
e. For satisfaction of one's needs

25. Amount of a raw mass produced by plants per unit area over a given time is called:
a. Producing capacity
b. Stocking rate
c. Raw produce
d. Massa of raw reserve
e. Density of raw reserve

26. Choose the wrong item in the species resource characteristics list below:
a. Density
b. Layering
c. Chemical composition
d. Projective cover
e. Biological reserve

27. Useful raw resource of annual herbaceous plants where overground organs are used as a raw materials equals:
a. Till 90 % of biological reserve
b. 50 % of biological
c. 25-30 % of biological

e. Mature vegetative parts of MP

8. Name the resource index defined as a certain species raw mass weight per area unit.
a. Density of raw reserve
b. Projective cover
c. Useful resource
d. Biological reserve
e. Producing capacity

9. Useful raw resource of herbaceous plant where underground organs are used as a raw materials equals:
a. Till 90 % of biological
b. 50 % of biological
c. 25-30 % of biological
d. 25 % of biological
e. 10 % of biological

10. Define the case when raw produce size and raw reserve density will coincide.
a. If perennial shoots are used as a raw material
b. If perennial rhizome are used as a raw material
c. If a rind is a raw material
d. If an anther dust is a raw material
e. If one-year shoots are used as a raw material

11. The main task of medicinal plants resources management is:
a. Development of measures of medicinal plants resources saving
b. Detection of medicinal plants species and evaluation of respective resources
c. Assessment of bioactive substances content
d. Implementation into crops of foreign species of medicinal plants
e. All above

12. Herbal raw materials are:
a. Plants which historically grow at defined area
b. Plants growing in the same phytocenosis
c. Whole plants or their parts, which can be used directly or after handling
d. Plant species which contains bioactive substances and are used in medicine
e. Dried grinded plants which are used in medicine

13. Useful raw resource of herbaceous plant where reproductive organs (fruits, flowers, inflorescences) are used as a raw materials equals
a. Till 90 % of biological
b. 50 % of biological
c. 25-30 % of biological
d. 25 % of biological
e. 10 % of biological

d. 25 % of biological
e. 10 % of biological

28. During geobotanical description composition general projective cover is taken into consideration. It is presented as:
a. Part of one
b. %
c. kg
d. hectare
e. g/m^2

29. Totality of natural plants groups which are presented at defined area is called:
a. Flora
b. Raw resources
c. Phytocenosis
d. Association
e. Greenery

30. Which wording of vital plant form is correct?
a. This is an ability of create of fruits of different form
b. This is a type of a stem placement in the space
c. This is an appearance of certain groups of plants
d. This is an ability of plants to form flowers of different forms
e. This is a peculiarity of stem form of different plants groups

31. Medicinal plants resources management study:
a. Variety of resources of plants and fungi for their further use in medicine and pharmacy
b. Variety of resources of plants, minerals and fungi for their further use in medicine and pharmacy
c. Variety of minerals for their further use in industry
d. Variety of plants and animals resources for their further use in medicine and pharmacy
e. All above

32. Next item does not belong to plants medicinal raw materials
a. Seeds
b. Leaves
c. Filaments
d. Roots
e. Flowers

33. Quantity of specimen at defined area represented in grade is called:
a. Crop yield
b. Density
c. Producing capacity
d. Layering
e. Density

14. * Special use of natural herbal resources is carried out:
a. For profit earning after sale of this resources of their handling products
b. For satisfaction of own needs
c. For manufacturing and science needs
d. According to special license
e. Without any license

15. Choose incorrect sign of phytocenosis:
a. This is a plant group
b. Different soil and climatic conditions
c. Can be natural and artificial
d. It is formed in process of evolution
e. It covers certain area

16. Horizontal split of phytocenosis is called:
a. Modeling
b. Density
c. Polarization
d. Layering
e. Cover

17. Plant species pool of defined area is called:
a. Phytocenosis
b. Greenery
c. Raw recourses
d. Association
e. Flora

18. Particular raw quantity picked in certain area in defined year is called:
a. Producing capacity
b. Stocking rate
c. Production of raw materials
d. Yield
e. Crop yield

19. Part of useful raw resource of which is defined taking in consideration a period of raw species renewal is called:
a. Biological reserve
b. Acceptable volume of annual use
c. Density of raw reserve
d. Useful resource
e. Yield

20. Allowable mean volume of natural resources use taking in consideration that resources renewal capacity are approved for a period of 5-10 years. This term is called:
a. Standard of special use of natural herbal resources
b. Limits of special use of natural herbal resources
c. Useful resources
d. Biological reserve
e. Possible stocking volume

34. Historically formed plants group having an area with the uniform type of soil and climatic conditions is:
a. Phytocenosis
b. Biotope
c. Association
d. Flora
e. Greenery

35. Average rate of crop yield sum per unit of area (during 2-5 years) is called:
a. Density of raw reserve
b. Volume of stocking
c. Producing capacity
d. Density
e. Crop yield

36. Useful raw resource of perennial herbaceous plants where overground organs are used as a raw materials equals:
a. Till 90 % of biological reserve
b. 50 % of biological reserve
c. 25-30 % of biological reserve
d. 25 % of biological reserve
e. 10 % of biological reserve

37. Such term as a «projective cover» does not used for:
a. Herbaceous plants
b. Bushes
c. Suffrutex
d. Groundling plants
e. Trees

38. Structural development of phytocenosis into sharply separated horizontal layer is called:
a. Modeling
b. Density
c. Polarization
d. Layering
e. Cover

39. Resource index which is identified as area multiply by density of raw reserve:
a. Biological reserve
b. Useful resource
c. Acceptable volume of annual use
d. Density of raw reserve
e. Density

40. Choose the correct wording of the definition «Yield»:
a. Raw quantity received per area unit
b. Raw quantity received per certain area in defined year
c. Raw quantity received per defined area during all operating period
d. Quantity of raw produced by plants during certain period at defined area
e. Potential opportunity of area regarding of raw volume

TOPIC 2.

Classification of medical plants by the reservoir of biologically active substances, action and taxonomy. Ways to find new sources of raw medicinal plants, closely related species of medical plants.

Purpose: to learn to identify the connection between the systematic position of medicinal plants and the presence in it biologically active substances.

to know: main group of biologically active substances which are in medicinal plants; belong by the content such biologically active substances of herbs to certain taxonomic ranks; main medicinal plants from certain families and their raw materials; vectors of the pharmaceutical market; closely related species of medicinal plants.

to be able to: correlate the systematic position of medicinal plants with their chemical composition; closely identify medicinal plants; reveal a systematic relationship between position of medicinal plants species and the presence in it of biologically active substances; identify diagnostic features of medicinal plants of certain families, genus.

Educational objectives:

Task 1. Give examples of medicinal plants which have similar use and belong to one family, analyze their chemical composition.

Family **Action**	
Medical plant	**Chemical composition**

Task 2. Give examples of medicinal plants which have similar use and belong to different families, analyze their chemical composition.

Family	
Medical plant	**Chemical composition**
Family	
Family	

Task 3. To submit a list of Latin names of plants that contain a group of biologically active substances. Group it by families and genera.

Group of biologically active substances	
№	**Species of medical plants**
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
Specify the number of medicinal plants species belonging to the same family	
Family _____ **Genus** _____ **Class** _____	
Group of biologically active substances	
№	**Species of medical plants**
1.	
2.	
3.	
4.	
5.	
6.	
7.	

8.	
9.	
10.	
11.	
12.	
Specify the number of medicinal plants species belonging to the same family	
Family _____ **Genus _____** **Class _____**	
Group of biologically active substances	
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
Specify the number of medicinal plants species belonging to the same family	
Family _____ **Genus _____** **Class _____**	
Group of biologically active substances	
№	**Species of medical plants**
1.	
2.	
3.	

4.	
5.	
6.	
7.	
8.	
9.	

Signature of teacher _____

PRACTICE TESTS

1. As it has been identified the largest quantity of medicinal plants species in Ukraine belongs to family:
a. Lamiaceae
b. Asteraceae
c. Apiaceae
d. Rosaceae
e. Fabaceae

2. The largest quantity of species which can be used as a source of volatile oils revealed in the specimen of family:
a. Lamiaceae
b. Asteraceae
c. Apiaceae
d. Rosaceae
e. Fabaceae

3. Medicinal plants of this family are mainly characterized as a source of vitamins and carbohydrates:
a. Poaceae
b. Asteraceae
c. Brassicaceae
d. Rosaceae
e. Fabaceae

4. Medicinal plants of this family are used for medicinal and food purposes and contains high quantity of flavonoids, proteins and carbohydrates. Choose correct answer:
a. Poaceae
b. Asteraceae
c. Brassicaceae
d. Rosaceae
e. Fabaceae

5. Species *Mentha piperita* belongs to officinal medicinal plants but does not wild. Which wild species of *Mentha* are used for selection of high-menthol species?
a. M. pulegium and M. aquatica
b. M. arvensis and M. spicata
c. M. aquatica and M. longifolia

21. *According to mechanism of action of bioactive substances of medicinal plants they are divided into main groups:
a. Anti-inflammatory, bactericidal
b. Food, dietetic
c. Cardiotonic, cardiostatic
d. Laxatives, antidiarrheal
e. Fodder

22. The most known quantity of medicinal plants belongs to families:
a. Poaceae, Rosaceae
b. Apiaceae, Fabaceae
c. Brassicaceae, Fabaceae
d. Lamiaceae, Asteraceae
e. Urticaceae, Ericaceae

23. Cumulation of similar bioactive substances is pertained to medicinal plants at level:
a. Division, order
b. Genus, family
c. Division, class
d. Section, order
e. Kingdom, division

24. * Among listed below bioactive substances of medicinal plants choose ones belongs to the products of secondary metabolism:
a. Proteins
b. Glycosides
c. Flavonoids
d. Carbohydrates
e. Vitamins

25. The source of vitamins and carbohydrates are mainly species of family:
a. Lamiaceae, Fabaceae
b. Asteraceae, Poaceae
c. Scrophulariaceae, Fabaceae
d. Rosaceae, Brassicaceae
e. Solanaceae, Cannabaceae

d. M. japonica and M. pulegium
e. *M. longifolia and M. asiatica*

6.* There are species among main medicinal plants of Fabaceae family which are under protection in Ukraine. Mark these species:
a. Galega officinalis
b. Melilotus officinalis
c. Ononis arvensis
d. Astragalus dasyanthus
e. Glycyrrhiza glabra

7. Medicinal plant *Galega officinalis* belongs to Fabaceae family. This plant is a valuable source of medicinal products which reduce the level of sugar. Mark active substances of this plant.
a. Alkaloids, saponins, flavonoids
b. Cardiac glycosides, flavonoids, phenol-carboxylic acids
c. Coumarins, volatile oils, isoflavoloids
d. Pectin substances, inulin, tanning agents
e. Saponins, pectin substances, coumarins

8. This plant belongs to Brassicaceae family and contains thioglycosides and fatty oil
a. Brassica juncea
b. Erysimum diffusum
c. Armoracia rusticana
d. Capsella bursa-pastoris
e. Thlaspi arvense

9. Classification of medicinal products according to presence of bioactive substances is carried out using next criterion:
a. Taxonomic
b. Component
c. Pharmaco-therapy
d. Raw-morphology
e. Biochemical

10.*Among listed below bioactive substances of medicinal plants choose ones belongs to the products of primary metabolism:
a. Lipide
b. Phenole
c. Flavonoids
d. Cumarine
e. Carbohydrates

11. Define the family containing the largest quantity of medicinal plants species in Ukraine:
a. Lamiaceae
b. Brassicaceae
c. Apiaceae
d. Rosaceae
e. Fabaceae

12.*Among listed below bioactive substances of

26. Pharmacotherapeutical classification of medicinal plants is based on:
a. Types of medicinal raw materials
b. Types of actions of bioactive substances
c. Types of bioactive substances
d. Ways of use of bioactive substances
e. Life forms of medicinal plants

27. The next species of wild medicinal plants belongs to Rosaceae family:
a. Capsella bursa-pastoris, Erysimum diffusum, Armoracia rusticana
b. Potentilla erecta, Fragaria vesca, Agrimonia eupatoria
c. Leonurus quinquelobatus, Thymus serpyllum, Origanum vulgare
d. Daucus carota, Conium maculatum, Foeniculum vulgare
e. *Datura stramonium, Solanum nigrum, Hyoscyamus niger*

28. Medicinal plant Conium maculatum belongs to the family Apiaceae and is used as a treatment of cancer. Which are active substances of this plant?
a. Cardiac glycoside, flavonoids, phenol-carboxylic acids
b. Coumarins, volatile oils, isoflavoloids
c. Pectin substances, inulin, tanning agents
d. Alkaloids, volatile oils, chromons
e. Alkaloids, saponins, flavonoids

29. Name the Family the plants such as *Capsella bursa-pastoris, Erysimum diffusum, Armoracia rusticana* belong to:
a. Apiaceae
b. Asteraceae
c. Brassicaceae
d. Rosaceae
e. Papaveraceae

30. The species Thymus is presented in Ukraine flora approximately by 40 species which contains bioactive substances. Mark the species recognized by the official medicine:
a. Thymus alternans
b. Th. pallasianus
c. Th.pulegioides
d. Th. tauricus
e. *Th. serpyllum*

31. The largest quantity of species which can be used as a source of volatile oils revealed in the specimen of family:
a. Asteraceae
b. Apiaceae
c. Rosaceae
d. Fabaceae
e. Tiliaceae

32. Indicate the classification of plant

medicinal plants choose ones belongs to the products of secondary metabolism:

a. Lipide
b. Glycoside
c. Carbohydrates
d. Alkaloids
e. Vitamins

13. These annual or biennial medicinal plants are used for medical and food purposes. Define the family.

a. Poaceae
b. Asteraceae
c. Brassicaceae
d. Rosaceae
e. Fabaceae

14. Which species of Thymus genus are mainly used by the official medicine in Ukraine?

a. Th. marschalianus ma Th. pulegioides
b. Th. serpyllum ma Th. pallasianus
c. Th. dimorphus ma Th. vulgaris
d. Th. pulegioides ma Th. serpyllum
e. *Th. serpyllum ma Th. Vulgaris*

15. What is the family name of plants which are used for medical and food purposes, contain a lot of vitamins, carbohydrates, polysaccharides and are characterized the largest variety of life-forms?

a. Poaceae
b. Asteraceae
c. Brassicaceae
d. Rosaceae
e. Fabaceae

16. Choose a plant which belongs to the Rosaceae family and is used as an industrial source of gum.

a. Rosa canina
b. Armeniaca vulgaris
c. Aronia melanocarpa
d. Beta vulgaris
e. *Malus domestica*

17. Mark those species of wild growing medicinal plants which belongs to Lamiaceae family:

a. Capsella bursa-pastoris Erysimum diffusum Armoracia rusticana
b. Potentilla erecta, Fragaria vesca, Agrimonia eupatoria
c. Leonurus quinquelobatus, Thymus serpyllum, Origanum vulgare
d. Daucus carota Conium maculatum Foeniculum vulgare
e. *Astragalus dasyanthus, Galega officinalis, Robinia officinalis*

18. This plant of Apiaceae family contains poisonous alkaloid substances.

a. Ammi majus
b. Pimpinella anisum
c. Conium maculatum
d. Apium graveolens

preparations which takes into consideration in order to shelving them in the drugstore.

a. Taxonomic
b. Component
c. Pharmaco-therapy
d. Raw-morphology
e. Biochemical

33. *According to mechanism of actions of medicinal plants bioactive substances these plants can be divided into:

a. Cholagogue
b. Fodder
c. Diuretic
d. Spicy-aromatic
e. Food

34. Choose bioactive substances which belong to products of primary metabolism:

a. Alcaloids
b. Glycosides
c. Coumarines
d. Proteins
e. Lignin

35. The majority of species of Solanaceae family contain bioactive substances which belong to:

a. Lipids
b. Proteins
c. Volatile oils
d. Flavonoids
e. Alcaloids

36. The majority of Apiaceae family medicinal plants species are the source of:

a. Tanning agents and fats
b. Volatile oils and furocumarins
c. Saponins and flavonoids
d. Alkaloids and carbohydrates
e. Glycosides

37 Which of the listed below medicinal plants species is presented in Ukraine by many species similar by component composition?

a. Glycyrrhiza
b. Achillea
c. Arnica
d. Calendula
e. Cichorium

38. The next species of Fabaceae family belong to medicinal plants:

a. Capsella bursa-pastoris, Erysimum diffusum, Armoracia rusticana
b. Salvia officinalis, Thymus serpyllum, Origanum vulgare

e. Archangelica officinalis

19. Classification of medicinal plants according to visual trait is carried out by criterion.
a. Taxonomic
b. Component
c. Pharmaco-therapeutic
d. Raw morphology
e. Botanic

20. Valuable components of volatile oils of the genus Thymus plants are thymol, limonene and cyneol. Raw material of this imported plant contains a lot of cyneol.
a. Salvia officinalis
b. Illicium verum
c. Eucalyptus globulus
d. Syzygium aromáticum
e. *Cinnamomum verum*

c. Rosa canina, Fragaria vesca, Agrimonia eupatoria
d. Daucus carota Conium maculatum Foeniculum vulgare
e. *Astragalus dasyanthus, Galega officinalis, Robinia officinalis*

39. This medicinal plant of Fabaceae family us used due to triterpene glycosides, flavonoids and pectine substances.
a. Glycyrrhiza glabra
b. Sophora japonica
c. Medicago sativa
d. Trigonella foenum-graecum
e. *Robinia pseudoacacia*

40. Medicinal plants *Artemisia absinthium, Silybum marianum, Cichorium intybus* belong to family:
a. Asteraceae
b. Brassicaceae
c. Apiaceae
d. Rosaceae
e. Lamiaceae

TOPIC 3.

Diversity of medical plants.

Geobotanical bases of the resources of medical plants.

Purpose: get knowledge from diversity and eco-coenotic differentiation of medicinal plants.

to know: system of classification of herbs and the World Health Organization; diversity of medicinal plants in different countries; features of the use medicinal plants in Europe; diversity of medicinal plants of Ukraine; eco-coenotic affinity main species of medicinal plants.

to be able to: explore the use of medicinal plants in different countries; determine the ways of using of medicinal plants in the world; distinguish between medicinal plants introduced, cultivated and wild species; identify eco-coenotic affinity of certain type medicinal plants.

Educational objectives:

Task 1. Work out the details from the classification of medicinal plants by World Health Organization.

Task 2. Give examples of countries that are leaders in the export of medicinal raw material.

№	Countries	The total number of plant species	The number of species of medicinal plants that are used	Examples of medical plants
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				

Task 3. Give examples of species of medicinal plants that Germany imports; specify which family they belong that contain active substances, and their eco-coenotic affinity.

Name of the species name of the raw materials	Eco-coenotic affinity BAS

Family	
Family	
Family	

Task 4. Writing a list of the names of species of medicinal plants by eco-coenotic affinity to forest, meadow, ruderal, coastal aquatic and wetland communities.

Name of the species name of the raw materials	**Eco-coenotic affinity**

Task 5. To give examples of herbs that belongs only to the cultivated in Ukraine.

Name of the species name of the raw materials	**Ways to use (drugs)**

Signature of teacher _____

PRACTICE TESTS

1. Choose the country where Tilia sp. flowers are mostly procured:
   a. Ukraine
   b. USA
   c. Spain
   d. Bulgaria
   e. Rumania
2. How many tracheal plants of Ukraine flora contains bioactive substances which are used or can be used for medicinal purposes?
   a. 50 species
   b. 100 species
   c. 2200 species
   d. 3500 species
   e. 6000 species

3. Which genus specimen of lichen is a component of medicinal product «Isla Moos» (the medicinal product is used as a treatment of upper airways diseases)?
   a. Cladonia
   b. Evernia
   c. Cetraria
   d. Usnea
   e. Parmelia

21. The broadest variety of medicinal plants is defined in:
   a. Vietnam and Thailand
   b. Malaysia and Ukraine
   c. China and India
   d. USA and Ukraine
   e. Czech Republic and Poland
22. The biggest exporter of medicinal plants raw materials in the world is:
   a. Ukraine
   b. Russia
   c. USA
   d. China
   e. Germany

23. Specimen of this genus of lichen is used in composition of pharmaceutical preparations which are used as a treatment of skin diseases and wounds:
   a. *Cladonia*
   b. *Evernia*
   c. *Cetraria*
   d. *Parmelia*
   e. *Usnea*

24. *Acorus calamus, Nymphaea alba, Nuphar lutea*

4. Medicinal products to treatment of cancer are received from medicinal fungi. Mark the medicinal product with this action which is received from *Inonotus obliquus*?
   a. Schizophyllan
   b. Krestyn
   c. Befungin
   d. Lentinan
   e. Cyclosporine

5. The life form of this plant is a bush:
   a. *Ledum palustre*
   b. *Urtica dioica*
   c. *Capsella bursa-pastoris*
   d. *Schizandra chinensis*
   e. *Thymus vulgaris*

6. * *Astragalus dasyanthus* grows in:
   a. Mountain terrain
   b. Steppe
   c. Bogs
   d. Forest-steppe
   e. Riversides

7. Choose the plant which grows in body of waters:
   a. *Nuphar lutea*
   b. *Glaucium flavum*
   c. *Convallaria majalis*
   d. *Arctium lappa*
   e. *Conium maculatum*

8. Which one of the listed below plants belongs to the hemycryptophytes group?
   a. *Nuphar lutea*
   b. *Vaccinium myrtillus*
   c. *Taraxacum officinale*
   d. *Glaucium flavum*
   e. *Ononis arvensis*

9. These medicinal plants of Ukrane grows in riverside phytocenosis
a. *Astragalus dasyanthus, Adonis vernalis, Paeonia tenuifolia*
b. *Acorus calamus, Nymphaea alba, Nuphar lutea*
c. *Agrostemma githago, Althaea officanalis, Consolida ajacis*
d. *Ononis arvensis, Potentilla erecta, Prunus spinosa*
e. *Betula pebdula, Pinus sylvestris, Corylus avellana*

10. There are several group of plants depending on character of underground perennial organs including tap roots (caudex type). Choose the plant which corresponds to the sighs of this group:

grow in … group.
   a. Ruderal group
   b. Littoral-water
   c. Segetal
   d. Bushes
   e. Forest

25. Plant which lives and fruits during one year is called … Example of annual herbaceous plant is:
   a. *Capsella bursa-pastoris*
   b. *Vinca minor*
   c. *Ledum palustre*
   d. *Schizandra chinensis*
   e. *Thymus vulgaris*

26. *Acorus calamus, Comarum palustre* are plants that predominate in:
   a. Paludal meadows
   b. Copses
   c. Drimophilous meadows
   d. Water meadows
   e. Groves

27. *Vaccinium myrtillus, V. uliginosum, V. vitis-idaea* grows in Polesye in:
   a. Meadows
   b. Bogs
   c. Water forests
   d. Pine and mixed forests
   e. Water body

28. The main resources of genus species *Crataegus, Rosa, Rubus* are located in the next groups:
   a. Edge of forests, glades, felling, forests' meadows, amongst bushes
   b. Meadows and bogs
   c. Leaves forests
   d. Water forests and bushes
   e. Low islands under the water

29. There is a list of the half-tree plants, one of those belongs to herbaceous plants. Mark it:
   a. Salvia officinalis
   b. Gnaphalium uliginosum
   c. Rosmarinus officinalis
   d. Ephedra equisetina
   e. Thymus serpillum

30. Depending on the nature of the underground organs identified a number groups of plants, including – root crop. Select the type that belongs to this group.
   a. Solanum tuberosum
   b. B. Inula helenium
   c. C. Elytrigia repens

a. *Plantago major*
b. *Iris pseudacorus*
c. *Elymus repens*
d. *Fragaria vesca*
e. *Taraxacum officinale*

11. What country of the world is the biggest producer of *Hypericum perforatum* raw materials?
    a. Romania
    b. USA
    c. Spain
    d. Bulgaria
    e. Ukraine

12. *Usnea, Cetraria, Evernia* belong to:
    a. Spore-bearing Embryophyta plants
    b. Fungi
    c. Flower plants
    d. Lichens
    e. Algae

13. The species of these medicinal plants of Ukraine grows only in meadows, meadows-steppe and steppe:
a. *Astragalus dasyanthus Adonis vernalis Paeonia tenuifolia*
b. *Acorus calamus, Nymphaea alba, Nuphar lutea*
c. *Agrostemma githago, Althaea officanalis, Consolida ajacis*
d. *Ononis arvensis, Potentilla erecta, Prunus spinosa,*
e. *Quercus robur, Frangula alnus, Convallaria majalis*

14. Fungi contain bioactive substance with neurotropic action. Mark the genus which can be prospective for this substances production.
    a. Hericium
    b. Psilocybe
    c. Lentinus
    d. Flammulina
    e. Schizophyllum

15. The life form of this plant is a half-shrub:
    a. *Vinca minor*
    b. *Capsella bursa-pastoris*
    c. *Ledum palustre*
    d. *Schisandra chinensis*
    e. *Thymus vulgaris*

16. *Asarum europaeum* grows in:
    a. Coniferous forests
    b. Mixed forests
    c. Leaf woods
    d. Bogs
    e. Meadows

d. D. Fragaria vesca
e. *E. Daucus sativa*

31. The broadest variety of medicinal plants is defined in:
    a. China and India
    b. France, Spain and Bulgaria
    c. Germany and Belgium
    d. Rumania and Poland
    e. Lithuania and Belarus

32. *The raw materials of these medicinal plants are prepared in large quantity in France:
    a. *Hypericum perforatum*
    b. *Arnica montana*
    c. *Helichrysum arenarium*
    d. *Urtica dioica*
    e. *Equisetum arvense*

33. *Cetraria islandica* belongs to:
    a. Vascular plants
    b. Fungi
    c. Lichen
    d. Moss
    e. Angiosperm

34. Amongst Polesye forests the biggest area is covered by:
    a. Birch forests
    b. Mixed forests
    c. Oak forests
    d. Pine forests
    e. Hornbeam forests

35. *Sambucus nigra, Rhamnus cathartica, Rosa canina* grow in:
    a. Ruderal
    b. Brakes vegetations
    c. Meadows vegetations
    d. Constant or temporary underflooding
    e. Segetal groups

36. *Salvia officinalis, Mentha aquatica, Thymus marshallianus* belongs to the family:
    a. Brassicaceae
    b. Asteraceae
    c. Lamiaceae
    d. Apiaceae
    e. Scrophulariacae

37. The main resources of *Oxyccocus palustris* are located in:
    a. Oligotrophic bogs
    b. Water forests
    c. Meadows and felling
    d. Meadows-steppe groups
    e. Coniferous forest

17. Choose the plant in the list below which grows in forests:
    a. *Nuphar lutea*
    b. *Glaucium flavum*
    c. *Vaccinium myrtillus*
    d. *Arctium lappa*
    e. *Conium maculatum*

18. Buds of recovery of tulip are in the soil, so this plant belongs to:
    a. Terophyte
    b. Phanerophyte
    c. Chamaephyte
    d. Cryptophytes
    e. Gemycryptophye

19. The main resources of *Vaccinium vitis-idaea* are found in:
    a. Edge of forests, glades, forests' meadows
    b. Coniferous and mixed forests
    c. Leaf woods
    d. Broad-leaved forests
    e. Brakes

20. *Betonica officinalis, Hypericum maculatum, Ononis arvensis, Potentilla erecta* grows in:
    a. Ruderal grous
    b. Brakes vegetations
    c. Meadows vegetations
    d. Constant underflooding
    e. Forests vegetations

38. About … species of medicinal plants are used in medicinal practice of Europe:
    a. 500 species
    b. 10 000 species
    c. 2 000 species
    d. 15 000 species
    e. 100 species

39. There is a list of the herbaceous plants below, one of the plants is a half-tree. Mark it:
    a. *Hypericum perforatum*
    b. *Arnica montana*
    c. *Helichrysum arenarium*
    d. *Urtica dioica*
    e. *Ephedra equisetina*

40. These medicinal plants of Ukraine grow in connection with synanthropic phytocenosis:
    a. *Astragalus dasyanthus Adonis vernalis Paeonia tenuifolia*
    b. *Polygonum* aviculare, *Plantago major*, *Urtica dioica*
    c. *Acorus calamus, Nymphaea alba, Nuphar lutea*
    d. *Agrostemma githago, Althaea officinalis, Consolida ajacis*
    e. *Ononis arvensis, Potentilla erecta, Prunus spinosa*

TOPIC 4.

Distribution and resource importance of medicinal plants in Ukraine and Arabic countries.

Purpose: master the knowledge about distribution and resource importance of species medicinal plants of Ukraine and Arabic countries.

to know: distribution diversity of medicinal plants.

to be able to: identify types of medicinal plants with resource significance; evaluate species diversity of certain phyto-geographical zones.

Educational objectives:

Task 1. Work out the information on the diversity of herbs botanical and geographic zones of Ukraine.

Task 2. Give examples of medicinal plants, belonging to a particular zone.

Botanical and geographic zones of Ukraine	Examples of medical plants

Task 3. Give examples of plants from different botanical and geographical zones that are only within these zones; in related areas; throughout Ukraine.

Botanical and geographic zones of Ukraine	**Species that are only in this zone**	**Species that are throughout Ukraine**

Task 4. Choose from herbarium plants that belong to the same botanical-geographical zone.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Task 5. Give examples of medicinal plants, their distribution in the Arabic countries.

Arabic countries	Examples of medical plants

The map of Arabic countries

Signature of teacher _____

PRACTICE TESTS

1. About 40 % of Carpathian vegetation are:
a. Forests, bushes
b. Meadow
c. Pasture
d. Steppe
e. Bogs

2. Which valuable plant is included into the Red Book of Ukraine and spread only in Alpine belt of Carpathian?
a. *Plantago major*
b. *Thymus serpillum*
c. *Acorus calamus*
d. *Rhodiola rosea*
e. *Helichrysum arenarium*

3. Violent influence of human at the biosphere causes change of vegetation character and appearance of new plants groups. These groups are named anthropogenic or:
a. Relict
b. Synanthropic
c. Reproductive
d. Wandering
e. Orographical

21. The largest quantity of medicinal plants species which have considerable nature resources raw materials of which are prepared for medicinal purposes are located in:
a. Forest-steppe
b. Carpathians
c. Polesye
d. Steppe
e. Crimea

22. How many species of medicinal plants are spread in all or almost all territory of Ukraine?
a. 2200 species
b. 1000 species
c. 550 species
d. About 170 species
e. 10 species

23. The largest quantity of medicinal plants species which present resource importance in Ukraine are located in:
a. Water meadows
b. Forests and near forests groups
c. Forbs bogs
d. Steppe groups
e. Bog groups

4. The main location of … is in the southern steppe regions of Ukraine.
a. *Vaccinium myrtillus*
b. *Gnaphalium uliginosum*
c. *Arnica montana*
d. *Menyanthes trifoliata*
e. *Astragalus dasyanthus*

5. Which of the listed below species belongs to ruderal plants groups?
a. Vaccinium myrtillus
b. Convallaris majalis
c. Fragaria vesca
d. Urtica dioica
e. Adonis vernalis

6. Among the prevailing species of Polesye there are primary resources of
a. *Arnica montana*
b. *Astragalus dasyanthus*
c. *Aconitum moldavicum*
d. *Acorus calamus*
e. *Thymus alpestris*

7. *Colchicum autumnale* is a valuable alkaloid-containing plant and it is spread in Ukraine mainly in …
a. Crimea
b. Polesye
c. Carpathians
d. Forest-steppe
e. Steppe

8. * *Paeonia tenuifolia* is included in The Red Book of Ukraine. This valuable medicinal plants is spread in Ukraine in…
a. Foothills of Crimea
b. Polesye
c. Foothills of Carpathians
d. Podilia
e. Steppe

9. This plant belongs to synanthropic groups:
A. *Menyantes trifoliata*
B. *Lycopodium clavatum*
C. *Aconitum sangooricum*
D. *Conium maculatum*
E. *Vaccinium vitis-idaea*

10. Choose a plant from the list below which belongs to a plurisonal species:
a. *Helichrysum arenarium*
b. *Calluna vulgaris*
c. *Tussilago farfara*
d. *Veratrum album*
e. *Astragalus dasyanthus*

24. Choose a species which is a valuable raw materials source in a forest steppe:
a. *Thymus marsallianus*
b. *Juniperus communis*
c. *Lycopodium clavatum*
d. *Menyantes trifoliata*
e. *Vaccinium vitis-idaea*

25. Choose a medicinal plant which is widespread around all Ukraine territory.
a. *Ledum palustre*
b. *Chelidonium majus*
c. *Vaccinium myrtillus*
d. *Arnica montana*
e. *Astragalus dasyanthus*

26. The primary raw materials resources of these species are located in Carpathians:
a. *Helichrysum arenarium, Gnaphalium uliginosum, Matricaria recutita*
b. *Centaurea cyanus, Frangula alnus, Ledum palustre*
c. *Calendula officinalis, Thymus vulgaris, Echinacea purpurea*
d. *Arnica montana, Hypericum maculatum, Veratrum album*
e. *Urtica dioica, Alnus glutinosa, Plantago major*

27. The basic resource potential of *Arnica Montana* of Ukraine is located in:
A. Forest-steppe
B. Steppe
C. Polesye
D. Carpathians
E. Forest zone

28. Some species of medicinal plants despite of their widespread in Ukraine are of low value around all the territory. Such as:
A. *Vaccinium vitis-idaea*
B. *Polygonum aviculare*
C. *Urtica dioica*
D. *Hypericum perforatum*
E. *Fumaria officinalis*

29. The majority of *Astragallus dasyanthus* locations are in:
A. Carpathians
B. Crimea
C. Forest zone
D. Steppe
E. Polesye

30. The basic tree species which dominate in forest cenosis of Polesye are valuable medicinal plants such as:

11. In case of absence of destructive external impact perennial synanthropic species are able to keep resource importance of population during:
a. 1-2 years
b. 2-3 years
c. 5-10 years
d. 20-30 years
e. Till 50 years

12. The primary resources of … are centered in softwood and mixed forests.
a. *Matricaria recutita*
b. *Polygonum aviculare*
c. *Acorus calamus*
d. *Achillea millefolium*
e. *Frangula alnus*

13. The resource importance of synanthropic flora equals at the average 15–20 % of grow area, but this value of some species can reach 50 %, including:
a. *Artemisia absinthium*
b. *Hypericum perforatum*
c. *Urtica dioica*
d. *Lavatera thuringiaca*
e. *Agrimonia eupatoria*

14. Shoots of *Ledum palustre*, shoots and leaves of *Vaccinum vitis idaea* and *Vaccinium myrtillus* are procured generally in:
a. Polesye
b. Crimea
c. Foothills of Carpathians
d. Forest-steppe
e. Highland of Carpathian Mountains

15. Choose a raw valuable species of a forest-steppe:
a. *Lycopodium clavatum*
b. *Juniperus communis*
c. *Rhamnus cathartica*
d. *Menyantes trifoliata*
e. *Vaccinium vitis-idaea*

16. Which of the listed below species grow in ruderal phytocenosis?
a. *Conium maculatum*
b. *Gnaphalium uliginosum*
c. *Aconitum sangooricum*
d. *Menyantes trifoliata*
e. *Astragalus dasyanthus*

A. *Pinus sylvestris, Betula pendula*
B. *Convallaria majalis, Potentilla erecta*
C. *Fagus sylvatica, Coryllus avellana*
D. *Rhamnus catartica, Hypericum perforatum*
E. *Abies alba, Alnus incana*

31. The widest species diversity of medicinal plants has been found in:
A. Forest-steppe zone
B. Steppe zone
C. Carpathians
D. Polesye
E. Roztocze

32. Among overall quantity of wild growing medicinal plants species of Ukraine the resource potential have:
A. 10 % of species
B. 5 %
C. 25 %
D. 50 %
E. 90 %

33. Choose a plant species which is spread around all Ukraine territory:
A. *Lycopodium clavatum*
B. *Menyanthes trifoliate*
C. *Vaccinium vitis-idaea*
D. *Capsella bursa-pastoris*
E. *Arnica Montana*

34. Choose a species in the list below which is a resource valuable in the forest-steppe:
A. *Ledum palustre*
B. *Vaccinium uliginosum*
C. *Lycopodium clavatum*
D. *Menyantes trifoliata*
E. *Thymus marchallianus*

35. The basic raw materials resources of these species are located in Polesye:
A. Helichrysum arenarium, Gnaphalium uliginosum, Matricaria recutita
B. Ledum palustre, Thymus serpillum, Arctostaphyllos uva-ursi
C. Centaurea cyanus, Frangula alnus, Artemisia absinthium
D. Hypericum maculatum, Arnica montana, Veratrum album
E. *Calendula officinalis, Thymus vulgaris, Echinacea purpurea*

36. The basic locations of *Glycyrrhiza glabra* in Ukraine are:
A. Forest-steppe
B. Polesye

17. The primary locations of a valuable medicinal plant such as *Adonis vernalis* in Ukraine are centered in:
a. Crimea
b. Polesye
c. Foothills of Carpathians
d. Forest-steppe
e. Steppe

18. Valuable medicinal plant such as *Rhodiola rosea* is found in Ukraine only in:
a. Crimea
b. Polesye
c. Carpathians
d. Forest-steppe
e. Steppe

19. The primary locations of this medicinal plant species are southern steppe regions of Ukraine:
a. *Lycopodium clavatum*
b. *Juniperus communis*
c. *Gnaphalium uliginosum*
d. *Paeonia tenuifolia*
e. *Vaccinium vitis-idaea*

20. Raw materials zone of widespread medicinal plants species majority flora of Ukraine includes:
a. Steppe zone
b. Forest and forest-steppe zone
c. Forest and steppe zone
d. Forest-steppe zone
e. Forest-steppe and steppe zone

37. Region with the less altered vegetable cover and one of the most valuable in Ukraine regarding medicinal plants raw materials resources is:
a. Steppe
b. Forest-steppe
c. Polesye
d. Roztocze
e. Crimea

38. This wide spread in Ukraine weed has acknowledged remedial properties and strong allergic potential
a. *Ambrosia artemisiifolia*
b. *Convallaria majalis*
c. *Vaccinium myrtillus*
d. *Lycopodium clavatum*
e. *Helichrysum arenarium*

39. Choose a valuable medicinal plant which is included in The Red Book of Ukraine and grows only in Carpathians:
a. *Abies alba*
b. *Hypericum maculatum*
c. *Centaurea carpatica*
d. *Potentilla erecta*
e. *Rhodiola rosea*

40. *Acorus calamus* grows in different parts of Ukraine, but basic resources of this plant are located in:
a. Carpathians
b. Polissy
c. Crimea
d. Steppe
e. Forest-steppe

TOPIC 5.

The threat of contamination of medicinal plants and raw materials. The influence of biotic and abiotic factors on the accumulation important bioactive compounds.

Purpose: study features of accumulation of biologically active substances by medicinal plants.

to know: the main risk of contamination of medicinal plants and their resources; the main source of contamination of wild medicinal plants; regularities

of accumulation biologically active compounds in medicinal plants, depending on climatic conditions; interconnection of micronutrients and accumulation in plants biologically active substances; dependence the content of biologically active substances from the stage of development of medicinal plants.

to be able to: install types of medicinal plants threatened by some anthropogenic factors; identify species of medicinal plants that can accumulate toxic substances; identify species of medicinal plants that have priority ability to accumulate nitrates, heavy metals, radionuclides.

Educational objectives

Task 1. To study the details of the main threats to medicinal plants and their resources.

Task 2. To study the information on pollution sources of medicinal plants.

Task 3. To group species of medicinal plants by the ability to accumulate different toxic substances.

Group of toxic substances	Examples of medical plants

Task 4. Give the list of plants, the synthesis of biologically active compounds which are depends on the content in the soil copper, manganese and cobalt.

Examples of medical plants	Raw materials	The basic BAS	Soil minerals

Task 5. Give examples of plants which period collecting materials differ in the phase of plant development from the general collection terms of morphological group.

Examples of medical plants	Raw materials	Individual collection period	General terms collection

Task 6. Give examples of major sources of pollution of medicinal plants on the territory of Arabic countries.

Country	Sources of pollution

Signature of teacher _____

PRACTICE TESTS

1. The key factor of production and accumulation of glycosides in plants is:
   a. High level of nitrogen in soil
   b. High level of insolation and solar activity in moderate climate
   c. High level of phosphorus and calcium in soil
   d. Height above sea level
   e. High level of selenium and chromium in soil

2. The highest level of ^{137}Cs is accumulated by:
   a. Ericaceae, Fabaceae;
   b. Boraginaceae, Cariophyllaceae;
   c. Lamiaceae, Poaceae;
   d. Asteraceae, Hypericaceae;
   e. Papaveraceae, Brassicaceae

3. Choose factors listed below that have favorable impact at harvest and accumulation of bioactive substances in compound fruits of Humulus:
   a. Cooper, manganese, molybdenum
   b. Chromium, vanadium, cobalt
   c. Manganese, Boron, molybdenum
   d. Cooper, vanadium, cobalt
   e. Selenium, nickel, chromium

4. The highest accumulation of ^{90}Sr by medicinal raw materials is typical to:
   a. *Origanum vulgare, Thymus marschallianus, Fragaria vesca*
   b. *Achillea millefolium, Agrimonia eupatoria, Rosa canina*
   c. *Plantago major, Artemisia absinthium, Polygonum aviculare*
   d. *Capsella bursa-pastoris, Erysimum diffusum, Armoracia rusticana*
   e. *Urtica dioica, Convallaria majalis, Polygonum hidropiper*

21. Accumulation of similar bioactive substances is inherent property of medicinal plants at level of:
   a. Genus, family
   b. Section, order
   c. Division, order
   d. Division, class
   e. Kingdom, division

22. Adding of these microelements to the soil contributes to increasing of crop yield and accumulation of bioactive substances in compound fruits of Humulus:
   a. Cuprum, manganese, molybdenum
   b. Chrome, vanadium, cobalt
   c. Cuprum, vanadium, cobalt
   d. Manganese, boron, molybdenum
   e. Selenium, nitrogen, iron

23. Accumulation of flavonoids grows in the next direction:
   a. From east to west
   b. From west to east
   c. From north to south
   d. From south to north
   e. From northwest to southern east

24. *The main threat to resources of *Acorus calamus* is:
   a. Increase of level of groundwater
   b. Shading
   c. Disturbance of growing environment
   d. Decrease of level of groundwater
   e. Excessive exploitation load

25. Which abiotic factor is a crucial condition to synthesis and accumulation of glycosides in plants?
   a. High level of chrome in the soil
   b. High level of nitrogen in the soil
   c. High level of insolation and solar activity in moderate climate condition

5. *The main source of pollution of wild medicinal plants are:
   a. Grazing pressure
   b. Industrial enterprise
   c. Motor and railway transport
   d. Agriculture and forestry where fertilizers, herbicides and pesticides are used
   e. All above

6. About 70 % of resource potential of these plants is located in polluted by radionuclide Ukraine area:
   a. *Potentilla erecta, Helichrysum arenarium, Gnaphalium uliginosum*
   b. *Rhamnus cathartica, Rosa canina, Thymus marchallianus*
   c. *Frangula alnus, Menyanthes trifoliata, Lycopodium clavatum*
   d. *Centaurea cyanus, Frangula alnus, Ledum palustre*
   e. *Capsella bursa-pastoris, Erysimum diffusum, Armoracia rusticana*

7. * Quality composition of bioactive substances of wild plants depends mostly on:
   a. Chemical composition of soil
   b. Temperature conditions during vegetation period
   c. Amount of precipitations and light
   d. Fertilizer application
   e. All listed above

8. Accumulation of alkaloids in plants and variety of alkaloid containing plants:
   a. Increases from north to south
   b. Increases from west to east
   c. Decreases from west to east
   d. Decreases from north to south
   e. Increases from southeast to northwest

9. Increase of level of cardiac glycosides in *Digitalis* species depends on presence in the soil:
   a. Selenium and zinc
   b. Iodine and iron
   c. Chrome and nickel
   d. Manganese and molybdenum
   e. Cobalt and boron

10. Exhaustion of the natural resources of *Menyanthes trifoliata* in Ukraine is primary connected with:
   a. Exploitation load
   b. Deforestation
   c. Radioactive contamination
   d. Drying-out
   e. Haymowing
   d. High level of phosphorus and calcium in the soil
   e. Height above sea level

26.* The main source of pollution of wild medicinal plants are:
   a. Industrial enterprise
   b. Grazing pressure
   c. Motor and railway transport
   d. Agriculture and forestry where fertilizers, herbicides and pesticides are used
   e. Pasquale load

27. About 80 % of resource potential of these plants is located in polluted by radionuclide Polesye area of Ukraine:
   a. *Arctostaphyllos uva-ursi*
   b. *Thymus serpylum*
   c. *Potentilla erecta*
   d. *Dryopteris filix-mas*
   e. *Pteridium aquilinum*

28. The highest accumulation of ^{90}Sr by medicinal raw materials is typical to the next species:
   a. *Artemisia absinthium*
   b. *Achillea millefoliu*
   c. *Capsella bursa-pastoris*
   d. *Urtica dioica*
   e. *Plantago major*

29. The lowest accumulation of ^{90}Sr by medicinal plant species is typical to:
   a. *Urtrica dioica*
   b. *Convallaria majalis*
   c. *Thymus marschallianus*
   d. *Polygonum aviculare*
   e. *Rosa canina*

30. These species are under the thread of natural resources depletion as a result of environmental conditions deterioration and exploitation load:
   a. *Calendula officinalis, Thymus vulgaris, Echinacea purpurea*
   b. *Helichrysum arenarium, Gnaphalium uliginosum, Matricaria recutita*
   c. *Convallaria majalis, Menyanthes trifoliata, Thymus serpyllum*
   d. *Centaurea cyanus, Frangula alnus, Vaccinium myrtillus*
   e. *Capsela bursa-pastoris, Urtica dioica, Plantago major*

31. * Quality composition of bioactive substances of wild plants depends mostly on:
   a. Chemical composition of soil
   b. Temperature conditions during vegetation period

11. *The main threats for medicinal plants and their resources are:
    a. Climate change
    b. Excessive exploitation load
    c. Alteration of environment of growing
    d. Pollution of environment of growing
    e. All above

12. 100 % of resource potential of this plant is located in polluted by radionuclide Ukraine area:
    a. *Thymus serpylum;*
    b. *Arctostaphyllos uva-ursi;*
    c. *Potentilla erecta;*
    d. *Dryopteris filix-mas;*
    e. *Altheaea officinalis*

13. The biggest value of transition coefficient of ^{137}Cs from soil to medicinal raw materials has:
    a. *Ledum palustre;*
    b. *Calluna vulgaris;*
    c. *Vaccinium vitis-idaea;*
    d. *Arctostaphylos uva-ursi;*
    e. *Achillea millefolium.*

14. Adding of these microelements to the soil contributes to increasing of cardiac glycosides level in specimens of *Digitalis* genus:
    a. Cooper, manganese
    b. Chrome, vanadium
    c. Manganese, molybdenum
    d. Cooper, cobalt
    e. Nickel, selenium

15. These medicinal plants' species accumulate the less quantity of ^{90}Sr:
    a. *Urtica dioica,Convallaria majalis, Polygonum hidropiper;*
    b. *Origanum vulgare, Thymus marschallianus, Fragaria vesca;*
    c. *Polygonum aviculare, Viola tricolor, Mentha arvensis;*
    d. *Agrimonia eupatoria, Rosa canina, Quercus robur;*
    e. *Althaea officinalis, Atropa belladonna, Archangelica officinalis.*

16. About 40 % of resource potential of these plants is located in polluted by radionuclide Ukraine area:
    a. *Centaurea cyanus, Frangula alnus, Vaccinium myrtillus;*
    b. *Origanum vulgare, Thymus marschallianus, Fragaria vesca;*
    c. *Helichrysum arenarium, Gnaphalium uliginosum, Matricaria recutita;*
    d. *Althaea officinalis, Atropa belladonna,*
    c. Amount of precipitations and light
    d. Size of a plant
    e. All listed above

32. The main threats for the resources of *Vaccinium myrtillus, Convallaria majalis* species are:
    a. Excessive exploitation load
    b. Pollution of growing places
    c. Deforestation
    d. Popularity of folk medicine phytotherapy
    e. Drainage melioration

33. The highest accumulation rate of 90Sr by medicinal raw materials is typical to plants which grow at the lowest parts of flank of hill, including:
    a. *Agrimonia eupatoria*
    b. *Convallaria majalis*
    c. *Capsella bursa-pastoris*
    d. *Betonica officinalis*
    e. *Plantago major*

34. Resources of valuable species of wild plants are exhausted due to:
    a. Low use control mechanisms
    b. People do not have enough information about thread to resources
    c. Overuse
    d. Alteration of environment of growing
    e. All above

35. The least value level of passage of ^{137}Cs from ground to medicinal plant raw materials amongst of species of Ericaceae family has:
    a. *Calluna vulgaris*
    b. *Vaccinium vitis-idaea*
    c. *Ledum palustre*
    d. *Arctostaphylos uva-ursi*
    e. *Vaccinium myrtillus*

36. About 90 % of resource potential of this plant is located in polluted by radionuclide Ukraine area:
    a. *Centaurea cyanus*
    b. *Vaccinium vitis-idaea*
    c. *Gnaphalium uliginosum*
    d. *Althaea officinalis*
    e. *Oxycoccus palustris*

37. Drying-out makes significant harm to resources of medicinal plants which grow preliminary in wet meadows, bogs and riverside groups, such as:
    a. *Thymus vulgaris*
    b. *Helichrysum arenarium*
    c. *Acorus calamus*
    d. *Centaurea cyanus*

Archangelica officinalis;
e. *Vaccinium vitis-idaea Potentilla alba Potentilla erecta.*

17. Accumulation of pollutants is typical to herbaceous plants with big densely spaced leaves which have a rosette and form a heavy bed. These species include:
    a. *Tussilago farfara*
    b. *Gnaphalium uliginosum*
    c. *Vaccinium vitis-idaea*
    d. *Helichrysum arenarium*
    e. *Achillea millefolium*

18. Choose the medicinal plant species which is low susceptible to the exploitation load:
    a. *Arctostaphylos uva-ursi;*
    b. *Calluna vulgaris;*
    c. *Achillea millefolium*
    d. *Ledum palustre;*
    e. *Vaccinium vitis-idaea*

19. Choose chemical elements which have favorable impact at accumulation and concentration of glycosides and volatile oils in plants tissues:
    a. Magnesium, manganese, zinc
    b. Fluorine, molybdenum, vanadium
    c. Cobalt, chromium, selenium
    d. Potassium, calcium, phosphorus
    e. Iron, nickel, bismuth

20. Depletion of natural resources of lily-of-the-valley in Ukraine is mainly connected with:
    a. Exploitation load
    b. Deforestation
    c. Radioactive pollution
    d. Drying-out
    e. Haymowing
    e. *Frangula alnus*

38. * The highest level of accumulation of pollutants is typical to herbaceous plants:
    a. With big densely spaced leaves
    b. With small needle-shaped leaves
    c. Have a rosette
    d. Form a heavy bed
    e. Isolated growing

39. Adding of fertilizer containing these microelements to the soil has favourable influence to concentration in plant tissues of glycosides and volatile oils:
    a. Selenium, nitrogen, iron
    b. Potassium, calcium, phosphorus
    c. Fluorine, molybdenum, vanadium
    d. Magnesium, chromium, cuprum
    e. Cuprum, manganese, nitrogen

40. Nitrate accumulation is species-specific characteristics of plants. The next species belongs to nitrate-phil:
    a. *Vaccinium myrtillus*
    b. *Gnaphalium uliginosum*
    c. *Ledum palustre*
    d. *Thymus serpyllum*
    e. *Urtica dioica*

TOPIC 6.

Cultivation of medicinal plants in Ukraine and leading European countries.

Purpose: get knowledge of the features of using wild and cultivated medicinal plant raw materials in the leading countries.

to know: advantages and disadvantages of cultivation medicinal plants; wild, introduced and cultivated medicinal plants; influence of external factors on

medicinal plants and their accumulation of biologically active compounds; priorities of using wild and cultivated raw medicinal plants.

to be able to: establish the origin of raw medicinal plants; make recommendations for the cultivation of medicinal plants.

Educational objectives

Task 1. Complete the table: advantages and disadvantages of cultivation medicinal plants.

Advantages of cultivation medicinal plants	**Disadvantages of cultivation medicinal plants**

Task 2. Give examples of species of medicinal plants, raw materials are collected in Ukraine only from the environment; separately – only cultivated plants; specify the type of raw materials and basic active ingredients.

Medical plan, raw materials are collected from the environment.

№	**Kinds of raw material**	**Medical plants**	**The main BAS**
1.			
2.			
3.			
4.			

5.			
6.			
7.			
8.			
9.			
10.			

Medicinal plants, raw materials are collected in Ukraine from cultivated plants

№	Kinds of raw material	Medical plants	The main BAS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Task 3. Complete the table. To specify in which European countries are cultivated for raw materials: *Lavandula angustifolia, Salvia sclarea, Valeriana officinalis, Mentha x piperita, Gentiana lutea, Papaver somniferum, Ginkgo*

biloba, Rosmarinus officinalis, Thymus spp., Hypericum perforatum, Valeriana officinalis, Althaea officinalis.

№	Kinds of raw material	Medical plants	Country of Europe
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			

Signature of teacher _____

PRACTICE TESTS

1. …medicinal plants are cultivated in the European countries
   a. 5-10
   b. 130-140
   c. 15-25
   d. 20-30
   e. 30-40
2. Cultivation of these medicinal plants is not profitable due to their fastidiousness to specific environmental conditions:

21. How many medicinal plant species are grown in special farms for raw materials?
   a. 20
   b. 200
   c. 114
   d. 150
   e. 300
22. These species of medicinal plants grow naturally and are cultivated to a raw materials in Ukraine:

a. *Arnica montana, Acorus calamus*
b. *Petroselinum crispum, Carum carvi*
c. *Agrimonia eupatoria, Hypericum perforatum*
d. *Valeriana officinalis,Althaea officinalis*
e. *Silybum marianum,Calendula officinalis*

3. Considerable volume of *Coryandrum sativum* is cultivated in:
a. Poland, Germany
b. France, Spain
c. Hungary, Denmark
d. Rumania, Bulgaria
e. Ukraine, Italy

4. Which countries have the biggest areas of cultivated plants?
a. Bulgaria, Romania and Poland
b. Italy, Germany and Bulgaria
c. Bulgaria, Germany and Spain
d. Romania, France and Spain
e. Hungary, France and Spain

5. Which plants cultivated in EU are in the biggest demand?
a. *Panax ginseng, Eleutherococcus senticosus*
b. *Carum carvi, Papaver somniferum*
c. *Rauvolfia serpentine, Datura stramonium*
d. *Chelidonium majus, Plantago major*
e. *Drosera rotundifolia, Ocinum basilicum*

6. These plants belong to priority cultivated plants in Germany:
a. *Chamomilla recutita, Mentha piperita*
b. *Eleutherococcus senticosus, Panax ginseng*
c. *Tussilago farfara, Artemisia vulgaris*
d. *Scutellaria baicalensis, Achillea millefolium*
e. *Thymus serpyllum, Arnica montana*

7. Which medicinal and aromatic plants are cultivated in large quantity in Bulgaria?
a. *Scopolia carniolica, Hyoscyamus niger*
b. *Vinca minor, Thymus vulgaris*
c. *Cynara scolymus, Origanum vulgare*
d. *Silybum marianum,Coriandrum sativum*
e. *Rauvolfia serpentine, Panax ginseng*

8. Choose a medicinal plant species which exists in Ukraine only as a cultivated.
a. *Mentha piperita, Echinacea purpurea*
b. *Lamium album, Origanum vulgare*
c. *Quercus robur, Pinus sylvestris*
d. *Chelidonium majus, Urtica dioica*
e. *Rumex confertus, R. acetosa*

9. These species of medicinal plants grow naturally and are cultivated to a raw materials in EU:
a. *Vaccinium myrtillus, Ledum palustre*
b. *Chelidonium majus, Scopolia carniolica*
c. *Hypericum perforatum, Origanum vulgare*
d. *Melissa officinalis, Mentha piperita*
a. *Capsella bursa-pastoris, Armoracia rusticana*
b. *Helichrysum arenarium, Bidens tripartita*
c. *Potentilla erecta, Calendula officinalis*
d. *Leonurus quinquelobatus, Thymus serpyllum*
e. *Erysimum diffusum, Fragaria vesca*

23. These species of medicinal plants are not spread in Ukraine naturally but cultivated for raw materials:
a. *Ledum palustre, Menyanthes trifoliata*
b. *Calendula officinalis, Silybum marianum*
c. *Capsella bursa-pastoris, Polygonum aviculare*
d. *Equisetum arvense,Artemisia vulgaris*
e. *Helichrysum arenarium, Rosa canina*

24. These introduced medicinal plants of Ukraine are used to landscape gardening and protection forests:
a. *Silene chlorantha, Glaucium corniculatum*
b. *Thymus marshallianus, Vaccinium vitis-idaea*
c. *Quercus robur, Prunus spinosa*
d. *Juglans mandshurica, Gleditsia triacanthos*
e. *Agrimonia eupatoria, Potentilla erecta*

25. Only raw materials of wild medicinal plants are used for processing:
a. *Althaea officinalis, Archangelica officinalis*
b. *Echinacea purpurea, Helichrysum arenarium*
c. *Centaurea cyanus, Ledum palustre*
d. *Calendula officinalis, Thymus vulgaris*
e. *Matricaria recutita, Atropa belladonna*

26. Cultivation of these medicinal plants is not profitable due to their fastidiousness to specific environmental conditions:
a. *Salvia officinalis, Calendula officinalis*
b. *Acorus calamus, Ledum palustre*
c. *Leonurus cardiaca, Melissa officinalis*
d. *Digitalis purpurea, Erysimum diffusum*
e. *Papaver somniferum, Cannabis sativa*

27. The leader amongst European manufacturers of lavender volatile oil is:
a. Ukraine
b. Portugal
c. Italy
d. France
e. Germany

28. The species of these medicinal plants exist in Ukraine only as a cultivated plants:
a. *Salvia officinalis, Lophanthus anisatum*
b. *Hypericum perforatum, Achillea millefolium*
c. *Pinus sylvestris, Betula pendula*
d. *Plantago major, P. lanceolata*
e. *Rumex acetosa, R. acetosella*

29. These species of medicinal plants grow naturally and are cultivated to a raw materials in EU:

e. *Rhamnus cathartica, Frangula alnus*

10. Choose species of medicinal plants which exist in EU only as a cultivated plant:
    a. *Tanacetum vulgare, Achillea millefolium*
    b. *Urtica dioica, Valeriana officinalis*
    c. *Glaucium flavum, Papaver rhoes*
    d. *Anetum vulgare, Mentha piperita*
    e. *Bidens cernua, Hypericum perforatum*
11. How many medicinal plant species are grown in EU in general:
    a. 130-140
    b. 145-160
    c. 170-180
    d. 180-190
    e. 190-200
12. Cultivation of these medicinal plants is not profitable due to their fastidiousness to specific environmental conditions:
    a. *Fagopyrum esculentum, Mentha piperita*
    b. *Capsella bursa-pastoris, Hypericum perforatum*
    c. *Leonurus cardiaca, Melissa officinalis*
    d. *Digitalis purpurea, Thymus vulgaris*
    e. *Ledum palustre, Drosera rotundifolia*
13. These species of medicinal plants are cultivated in Spain in large quantities for raw materials production:
    a. *Arctium lappa, Eleutherococcus senticosus*
    b. *Digitalis lanata, Artemisia abrotanum*
    c. *Lavandula spp., Anthemis nobilis*
    d. *Taraxacum officinalis, Althaea officinalis*
    e. *Plantago major, Urtica dioica*
14. Which countries have the biggest areas of cultivated plants?
    a. Poland, Romania and France
    b. France, Spain and Hungary
    c. Germany, Spain and Bulgaria
    d. Romania, France and Spain
    e. Italy, Germany and Bulgaria
15. Which cultivated in EU countries plant is the most popular?
    a. *Tussilago farfara, Fragaria vesca*
    b. *Urtica dioica, Betonica officinalis*
    c. *Capsella bursa-pastoris, Plantago major*
    d. *Papaver somniferum, Foeniculum vulgare*
    e. *Oenothera biennis, Artemisia absinthium*
16. These medicinal plants raw materials are cultivated and harvested in Poland in the largest quantities:
    a. *Lamium album, Leonurus cardiaca*
    b. *Alnus glutinosa, Lavandula angustifolia*
    c. *Cotinus coggigria, Coryllus avelana*
    d. *Centaurea cyanus, Papaver somniferum*
    e. *Aronia melanocarpa, Hypericum perforatum*
    a. *Betonica officinalis, Gratiola officinalis*
    b. *Melissa officinalis, Ocinum basilicum*
    c. *Gentiana lutea, Arnica montana*
    d. *Rumex alpinum, Tussilago farfara*
    e. *Anetum vulgare, Origanum majorana*
30. Which cultivated in EU countries plant raw materials are the most popular?
    a. *Capsella bursa-pastoris, Polygonum persicaria*
    b. *Vaccinium myrtillus, V. vitis-idaea*
    c. *Tussilago farfara, Urtica dioica*
    d. *Oenothera biennis, Sinapis alba*
    e. *Carum carvi, Foeniculum vulgare*
31. Medicinal plants species diversity in EU does not differ significantly. How many species of medicinal and aromatic plants are grown here in large quantity?
    a. 150 species
    b. 100 species
    c. 60 species
    d. 20 species
    e. 500 species
32. The biggest areas of cultivated medicinal plants in Europe are located in:
    a. Ukraine, Poland, Hungary
    b. Poland, Romania, Bulgaria
    c. France, Hungary, Spain
    d. Germany, Italy, Spain
    e. Lithuania, Belgium, Austria
33. These species of medicinal plants grow naturally and are cultivated to a raw materials in Ukraine:
    a. *Althaea officinalis Bidens tripartita Helichrysum arenarium*
    b. *Capsella bursa-pastoris Erysimum diffusum Armoracia rusticana*
    c. *Potentilla erecta, Fragaria vesca, Agrimonia eupatoria*
    d. *Leonurus quinquelobatus, Thymus serpyllum, Origanum vulgare*
    e. *Ledum palustre, Acorus calamus, Menyanthes trifoliate*
34. Only raw materials of cultivated medicinal plants are used for processing:
    a. *Althaea officinalis, Archangelica officinalis*
    b. *Helichrysum arenarium, Matricaria recutita*
    c. *Centaurea cyanus, Frangula alnus*
    d. *Calendula officinalis, Echinacea purpurea*
    e. *Atropa belladonna, Gnaphalium uliginosum*
35. Wild medicinal plants account for … % amongst medicinal plants of Europe.
    a. 90%
    b. 50%

17. Which species of medicinal and aromatic cultivated plants are first-priority in France?
    a. *Glycyrrhiza glabra, Leonurus cardiaca,*
    b. *Bidens tripartita, Melissa officinalis*
    c. *Lavandula angustifolia, Salvia sclarea*
    d. *Berberis vulgaris, Rhamnus cathartica*
    e. *Fagopyrum esculentum, Cichorium intybus*
18. Choose a medicinal plant species which exists in Ukraine only as a cultivated.
    a. *Calendula officinalis, Echinacea purpurea*
    b. *Arctium lappa, Hypericum perforatum*
    c. *Taraxacum officinalis, Thymus serpyllum*
    d. *Centaurea cyanus, Digitalis grandiflora*
    e. *Alnus glutinosa, Frangula alnus*
19. Raw materials of species of these medicinal plants are gathered in nature and cultivated:
    a. *Rumex confertus, Betonica officinalis*
    b. *Polygonum aviculare,Gratiola officinalis*
    c. *Capsella bursa-pastoris, Gnaphalium uliginosum*
    d. *Tussilago farfara, Alnus incana*
    e. *Gentiana lutea, Arnica montana*
20. Choose a species of medicinal plants which exist in EU only as a cultivated plant:
    a. *Salix alba, Quercus robur*
    b. *Betula pendula, Frangula alnus*
    c. *Ocimum basilicum, Melissa oficinalis*
    d. *Lamium album. Chamomilla recutita*
    e. *Adonis vernalis, Althaea officinalis*
    f.
    c. 10%
    d. 100%
    e. 20%
36. Raw materials of only wild medicinal plants are gathered in Ukraine for:
a. *Hypericum perforatum, Origanum vulgare*
b. *Ledum palustre, Vaccinium myrtillus*
c. *Silybum marianum. Anetum vulgare*
d. *Helichrysum arenarium, Cichorium intibus*
e. *Aronia melanocarpa, Calendula officinalis*
37. These medicinal and aromatic cultivated plants belong to priority group in Romania:
    a. *Arnica montana, Thymus serpyllum*
    b. *Matricaria recutita, Galega officinalis*
    c. *Digitalis purpurea, D.lanata*
    d. *Fagopyrum esculentum Carum carvi*
    e. *Artemisia dracunculus, Cynara scolymus*
38. Some species of medicinal and aromatic plants which are cultivated in Ukraine belong to agricultural plants, including:
    a. *Digitalis lanata, Panax ginseng*
    b. *Valeriana officinalis, Polygonum hydropiper*
    c. *Fagopyrum esculentum, Armoracia rusticana*
    d. *Arctium lappa, Achillea milefolium*
    e. *Taraxacum officinalis, Cichorium intybus*
39. Which cultivated in EU countries plant raw materials are the most popular?
    a. *Thymus serpillum, Th. vulgaris*
    b. *Urtica dioica, Ononis arvensis*
    c. *Tussilago farfara, Plantago major*
    d. *Foeniculum vulgare, Carum carvi*
    e. *Oenothera biennis, Hypericum perforatum*
40. *It is necessary to follow Good agricultural practice during cultivation of medicinal plants. It is banned to cultivate plants in soils which:
    a. Dirtied by sewage water
    b. Contain high level of high- density metals
    c. Rich by nutrients
    d. Dirtied by protective agents against insect attacks and plant diseases
    e. Ecologically pure

TOPIC 7.

Medicinal plants, fungi and lichens in of phytopreparations. The world market of medicinal and aromatic plants.

Purpose: to get knowledge about the diversity of medicinal plants, fungi and lichens, which are used in preparations.

to know: the main ways to use fungi and lichens in pharmaceutical practice; diversity of medicinal plants, raw materials or substances which belonging to drugs, listed in the State Register of Medicinal Products and the State Pharmacopoeia of Ukraine; trends and developments of the world market of aromatic and medicinal plants.

to be able to: orient in priorities of using raw materials in pharmaceutics; identify current trends of using lichens and fungi in the medical practice; define quality standards for herbal medicines and raw materials.

Educational objectives

Task 1. Make a list of fungi that are used in medical practice, specify their use.

Fungi	Using

Task 2. Give in a table list of medicinal plants Ukraine, are included into the Applications of the State Pharmacopoeia of Ukraine, their chemical composition, use.

№	Medical plants	The main BAS	Ways of using
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Task 3. Will process information on the use of aromatic plants in different countries. Give examples of countries, herbal medicines and raw materials of which imports by Ukraine in most.

№	Exporting country	Exporters company	The share of imported herbal medicines in Ukraine

Task 4. Give the list of medicinal plants that do not grow in Ukraine, but included in the State Pharmacopoeia of Ukraine, their chemical composition and usage.

Herbs	Chemical composition	Usage

Signature of teacher _____

PRACTICE TESTS

1. What division do fungi-like organisms where Thallus is used for medicinal purposes belong to?
    a. Zygomycota
    b. Chytridiomycota
    c. Basidiomycota
    d. Ascomycota
    e. Lichenophyta
2. Choose a country which is the main importer of volatile oils and oleo gum resin:
    a. Poland
    b. Hungary
    c. Germany
    d. France
    e. Great Britain
3. Medicinal product «Befunginum» is made from:
    a. *Amanita muscarina*
    b. *Trametes versicolor*
    c. *Lentinus edodes*
    d. *Inonotus obliquus*
    e. *Psilocybe semilanceata*
4. Fungi compounds with neurotropic action are of particular interest in the world. Choose the genus of these fungi:
    a. *Ganoderma*
    b. *Trametes*
    c. *Lentinus*
    d. *Inonotus*

21. According to pharmacotherapeutic classification bioactive substances of lichens have:
    a. Laxative action
    b. Antibiotic action
    c. Choleretic action
    d. Sedative action
    e. Diuretic action
22. Medicinal plants raw materials included in State Pharmacopoeia of Ukraine are imported from other countries:
    a. > 50 species
    b. About 100 species
    c. > 120 species
    d. > 1000 species
    e. < 10 species
23. The active substance of «Binan» is sodium salt of usnic acid. It is used as a treatment of burns, varicose diseases and trophic ulcers. The raw materials for this medicinal product is produce from:
    a. Fungi
    b. Ferns
    c. Lichens
    d. Algae
    e. Lycopodium
24. Sambucus nigra is included to a qualitative composition of next drugs:
    a. Stomat-phyto, Phytosed, Sedoflor

e. *Psilocybe*

5. *Reishi* fungus is used in medicine due to such compounds as:
    a. Triterpene and polysaccharide
    b. Vitamins and organic acids
    c. Alkaloids and glucans
    d. Proteins and lipids
    e. Flavonoids and alkaloids
6. Raw materials of some species of medicinal plants are used in various branches of industry. Choose a species of medicinal plants which also used in cosmetology:
    a. *Frangula alnus*
    b. *Chamomilla recutita*
    c. *Glaucium flavum*
    d. *Scopolia carniolica*
    e. *Rhamnus cathartica*
7. Carposome of the Split Gill is known as a source of raw materials to antitumoral drugs. Choose a name of this fungis:
    a. *Inonotus obliquus*
    b. *Trametes versicolor*
    c. *Lentinus edodes*
    d. *Schizophyllum commune*
    e. *Ganoderma lucidum*
8. «Broncholydin» is known in Germany medicinal product. It is recommended in case of throat inflammation. Choose a lichen which is used to the manufacturing of this drug:
    a. *Cetraria islandica*
    b. *Usnea barbata*
    c. *Parmelia perlata*
    d. *Ramalina bourgeana*
    e. *Lobaria pulmonaria*
9. German part of general European export of medicinal and aromatic plants is:
    a. 10%
    b. 20%
    c. 50%
    d. 75%
    e. > 80%
10. Choose an European country in the list below where export of medicinal plants raw materials is predominate over import:
    a. Italy, France
    b. Spain, Switzerland
    c. Hungary, Bulgaria
    d. Belgium, Luxemburg
    e. Great Britain, Germany
11. According to pharmacotherapeutic classification bioactive substances of fungi have:
    a. Astrictive action
    b. Diuretic action
    c. Antibiotic action
    d. Choleretic action
    e. Sedative action
    b. Allocholum, Phytodent, Gepatophytum
    c. Prostalad, Beroz, Gynaecophytum
    d. Sedaflox, Uroflox, Bronchophytum
    e. Gastroflox, Fitulvent phyto balsam, Rotocanum
25. 7-9 medicinal products containing such active substance as … have been registered in the pharmaceutical market of Ukraine:
    a. *Thymus serpyllum*
    b. *Acorus calamus*
    c. *Crataegus*
    d. *Leonurus quinquelobatus*
    e. *Plantago major*
26. More than 10 phytopreparations containing raw materials of active substances of listed below plants have been registered in Ukraine:
    a. *Convallaria majalis ,Melilotus officinalis*
    b. *Thymus serpyllum, Capsela bursa-pastoris*
    c. *Plantago major, Acorus calamus*
    d. *Frangula alnus, Quercus robur*
    e. *Betonica officinalis, Potentilla erecta*
27. Bioactive substances of Acorus calamus are parts of the composition of:
    a. Gepatophytum, Nephrophytum, Cholegran
    b. Prostalad, Beroz, Gynaecophytum
    c. Imuphyt, Prostatophyt, Sedaflox
    d. Proteflazid, Flavozid, Imuflazid
    e. Bronchophyt, Gastrophyt, Detoxyphyt
28. *Urtica dioica* is a part of composition of:
    a. Sedaflox, Uroflox, Nephrophyt
    b. Gastroflo, Fitulvent phyto balsam, Rotocan
    c. Prostalad, Beroz, Imuno-ton
    d. Allocholum, Phytofend, Gepatophyt
    e. Bronchophyt, Gastrophyt, Detoxyphyt
29. Proteflazid, Flavozid, Imuflazid have active substances from:
    a. *Deschampsia caespitosa, Calamagrostis epigeios;*
    b. *Vaccinium myrtillus, Linaria vulgaris;*
    c. *Galium verum, Viburnum opulus;*
    d. *Thymus serpullum, Chelidonium majus*
    e. *Pinus sylvestris, Juniperus communis*
30. Cardiopaside does not have such component as:
    a. *Humulus lupulus*
    b. *Acorus calamus*
    c. *Crataegus*
    d. *Leonurus quinquelobatus*
    e. *Althaea officinalis*
31. The majority of imported European phytopreparations include raw materials of medicinal plants or substance of medicinal plants raw materials which:
    a. Absent in Ukraine

12. Which EU countries are core consumers of raw materials of medicinal and aromatic plants?
    a. Poland, Czech Republic
    b. Italy, Portugal
    c. Germany, Great Britain
    d. Ukraine, Belarus
    e. Belgium, the Netherlands
13. Medicinal products of fungi are used as a treatment of cancer. Which species of fungi is a raw material to a «Krestin» manufacturing?
    a. *Inonotus bliquus*
    b. *Trametes versicolor*
    c. *Lentinus edodes*
    d. *Schizophyllum commune*
    e. *Ganoderma lucidum*
14. Fungi compounds with neurotropic action are of particular interest in the world. Choose the genus of these fungi:
    a. *Inonotus*
    b. *Trametes*
    c. *Lentinus*
    d. *Amanita*
    e. *Ganoderma*
15. Raw materials of some species of medicinal plants are used in various branches of industry. Choose a species of medicinal plants which also used for manufacturing of sweets:
    a. *Glycyrrhiza glabra*
    b. *Capsella bursa-pastoris*
    c. *Tussilago farfara*
    d. *Urtica dioica*
    e. *Oenothera biennis*
16. Raw materials of some species of medicinal plants are used in various branches of industry. Choose a species of medicinal plants which also used for manufacturing of food supplements:
    a. *Hypericum perforatum*
    b. *Alnus glutinosa*
    c. *Cotinus coggigria*
    d. *Hibiscus sabdariffa*
    e. *Lamium album*
17. Carposomes of turkey tail are known as traditional agents in Korea, China and Japan. Choose the Latin name of this fungus:
    a. *Inonotus obliquus*
    b. *Trametes versicolor*
    c. *Lentinus edodes*
    d. *Schizophyllum commune*
    e. *Ganoderma lucidum*
18. «Binan» is known in Russia medicinal product. It is used for treatment of varix dilatation. Choose a lichen which is used to the manufacturing of this drug:
    a. *Ramalina bourgeana*
    b. *Usnea barbata*
    c. *Parmelia perlata*
    b. Included in The Red Book of Ukraine
    c. Exist in Ukraine only as a cultivated plants
    d. Most of those are widespread in Ukraine
    e. Are regional rare plants
32. Edible mushrooms are the source of:
    a. Proteins
    b. Polysaccharides
    c. Lipids
    d. Volatile oils
    e. Alkaloids
33. The State Pharmacopoea of Ukraine includes information about raw materials of products of processing of … species of medicinal plants.
    a. About 50
    b. Almost 100
    c. > 120
    d. > 2 000
    e. > 3 000
34. Bioactive substances of these plants are the most often included into composition of medicinal products:
    a. *Valeriana officinalis,Crataegus, Leonurus quinquelobatus*
    b. *Gentiana lutea, Glycyrrhiza glabra, Mentha longifolia*
    c. *Adonis vernalis, Atropa belladonna, Archangelica officinalis*
    d. *Arnica montana, Frangula alnus, Ledum palustre*
    e. *Artemisia absinthium, Tanacetum vulgare, Euphrasia*
35. Raw materials of *Valeriana officinalis* is a part of composition of medicinal products registered in Ukraine:
    a. 5
    b. 10
    c. 35
    d. 50
    e. 120
36. *Hypericum perforatum* is a part of composition of:
    a. Sedaflox, Uroflox, Bronchophytum
    b. Gastroflo, Fitulvent phyto balsam, Rotocan
    c. Liksod, Phytosed, Cardiophytum
    d. Allocholum, Phytofend, Gepatophyt
    e. Prostalad, Beroz, Imuno-ton
37. For successful organs' transplantation in order to reduce a probability of rejection of the transplant a cyclosporine derived from … is used:
    a. Ferns
    b. Fungi
    c. Moss
    d. Gymnosperms
    e. Equisetopsida
38. The bioactive substances of listed below plants are the most often included in registered

d. *Cetraria islandica*
e. *Lobaria pulmonaria*

19. Annual volume of import of Germany medicinal and aromatic plants of general volume and cost of imported raw materials in Europe is:
    a. 10 %
    b. 30 %
    c. 50 %
    d. 75 %
    e. 90 %
20. Choose an European country in the list below where import of medicinal plants raw materials is predominate over export:
    a. Bulgaria, Czech Republic
    b. France, Germany
    c. Poland, Croatia
    d. Turkey, Hungary
    e. Romania, Poland
    f.

German medicinal products for treatment of respiratory tract in Ukraine:
    a. *Solanum dulcamara, Crataegus spp., Thymus spp;*
    b. *Hypericum perforatum, Achillea millefolium, Polygonum aviculare;*
    c. *Filipendula vulgaris, Rosa canina, Clematis recta*
    d. *Althaea officinalis, Hedera helix, Atropa belladonna;*
    e. *Arctostaphylos uva-ursi, Polygonum aviculare, Bidens tripartita*

39. During last 5 years … phytopreparations have been included to The State Register of Medicinal Products of Ukraine:
    a. About 5 thousands
    b. About 3 thousands
    c. > 1 thousand
    d. > 2 thousands
    e. About 50
40. Bioactive substances from … are part of composition of Isla-moss:
    a. *Cetraria islandica*
    b. *Thymus serpyllum*
    c. *Ganoderma lucidum*
    d. *Convallaria majalis*
    e. *Pinus sylvestris*

TOPIC 8.

The rules and period of collection, processing and storing of raw materials.

Purpose: to learn peculiarities of collection, processing and storing of raw materials.

to know: conditions and harvesting technology of medicinal plant; rational methods of gathering raw herbs of different morphological groups; methods of primary processing of raw herbs of different morphological groups; methods of drying of raw herbs that is used in medical practice; rules for storage of raw medicinal plants that contains various biologically active substances.

to be able to: determine the timing of collection raw herbs; conduct primary processing of raw materials; choose the right conditions for drying the raw materials of medicinal plants.

Educational objectives

Task 1. Determine the optimal phenological phases and establish timetable for harvesting of raw materials medicinal plants of different species.

№	Medical plants	Raw materials	Optimal phenological phases
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			

Task 2. Specify the optimal mode of drying herbs.

Herbs	Conditions of the drying
	T^0C / lighting

Task 3. Give requirements for packaging and transportation of raw materials by GACP.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Signature of teacher _____

PRACTICE TESTS

1. Just gathered raw materials can lose properties even during an hour, this is why it is recommended to provide… within the shortest possible time:
    a. Drying of raw materials
    b. Packing of raw materials
    c. Transportation of raw materials
    d. Labeling of raw materials
    e. Storage of raw materials
2. During the process of preparation of plant raw materials it is necessary to follow rules of gathering of raw materials when … is provided:
    a. Economical appropriateness
    b. Restoration of plants
    c. Preservation of root system
    d. Preservation of reproductive organs
    e. Preservation of vegetative organs
3. Which part of raw materials should be left to provide next seeds renovation of population?
    a. 15-20 %
    b. 25-30 %
    c. 35-40 %
    d. 45-50 %
    e. Depends on raw materials

21. In order to keep remedial properties and saving and renovation of medicinal plants resources raw materials of *Althaea officinalis and Valeriana officinalis* is prepared in:
    a. June-July
    b. August-September
    c. October-November
    d. December-January
    e. May-June
22. Alkaloid containing medicinal plants raw materials is dried in temperature:
    a. 50-60°C;
    b. 70-80°C
    c. 90-100°C;
    d. 25-35°C;
    e. 30-40°C.
23. Maximal shelf life of *Acorus calamus rhizome, Althaea officinalis radix, rhizome and radix Valeriana officinalis* is:
    a. 1 year
    b. 2 years
    c. 3 years
    d. 5 years
    e. 10 years
24. Which percent of annual herbal plants should be left in gathering area limits for

4. Leaves of live plants are gathered prior to large flowering. Which plants leaves are gathered after flowering?
    a. *Urtica dioica*
    b. *Hibiscus sabdariffa*
    c. *Cotinus coggigria*
    d. *Tussilago farfara*
    e. *Lamium album*
5. Preparation of gemmae is carried out in winter or early spring when gemmae are just start swelling but integumentary perulae are not start separating. Choose a temperature of drying of gemmae:
    a. Depends on raw materials
    b. 20-25^{0}C
    c. 30-35^{0}C
    d. 40-45^{0}C
    e. 50-60^{0}C
6. Raw materials of Ríbes nígrum and dog rose require fast drying in temperature:
    a. 20-25 ^{o}C
    b. 30-35 ^{o}C
    c. 40-45 ^{o}C
    d. 50-60 ^{o}C
    e. 80-90 ^{o}C
7. Choose abbreviation of the guideline which establish rules (requirements and recommendations) of good cultivation and gathering of plants raw materials (medicinal plants / plants raw materials) and is the basic to foundation of proper quality assurance system in medicine and pharmacy:
    a. GambX
    b. EMA
    c. SPU
    d. GACP
    e. WHO
8. Picked medicinal plants / raw materials of medicinal plants should be delivered to place of processing as soon as possible in order to avoid:
    a. Damage by pests
    b. Pressure
    c. Grinding
    d. Destruction
    e. All above
9. In case of open air drying of medicinal plants / medicinal plants raw materials is necessary to be spread thin layer. Which species raw materials are dried in 10–15 cm layer or in bundles?
    a. 10 %
    b. No less 20 %
    c. 20-30 %
    d. 5 % enough
    e. 50 %
25. During preparation of raw materials dug plant roots prior to drying are normally washed in cold water. There is some exception. This is a raw materials containing:
    a. Glycosides
    b. Tanning agents
    c. Volatile oils
    d. Mucus
    e. Alkaloids
26. Temperature of drying of this plant raw materials should not exceeded 30 ^{o}C due to high level of volatile oils. Choose in the list below:
    a. Echinacea purpurea
    b. Plantago major
    c. Vaccinium myrtillus
    d. Dryopteris filfx-mas
    e. Thymus serpyllum
27. In order to remain populations mature leaves of alive plants are gathered in rate:
    a. Not exceeded 50 % from spear
    b. Not exceeded 25 % from spear
    c. Not exceeded 5 % from spear
    d. Not exceeded 75 % from spear
    e. Not exceeded 10 % from spear
28. *Tussilago* leaves are used as an expectorant drug. This raw materials should be prepared:
    a. After flowering
    b. During flowering
    c. Prior to flowering
    d. During fruiting
    e. At the beginning of fruiting
29. Cortex of *Frangula* contains anthracene derivates. When is it recommended to use prepared cortex?
    a. In 1 year after preparation
    b. Fresh gathered
    c. In 1 month after preparing
    d. Just after druing
    e. In 6 months after preparing
30. Gathered gemmae of *Pinus silvestris, Populus nigra* and *Betula pendula* are poured out by thin layer on a parchment and are dried in well ventilated rooms in

a. *Glycyrrhiza glabra*
b. *Urtica dioica*
c. *Lavandula angustifolia*
d. *Berberis vulgaris*
e. *Rhamnus cathartica*

10. If raw materials are processed fresh in order to avoid losing quality temperature of storage conditions should be in limits:
a. From 1 °C to 5 °C
b. From 5 °C to 10 °C
c. From 10 °C to 15 °C
d. From 15 °C to 20 °C
e. From 20 °C to 25 °C

11. During process of medicinal plants raw materials preparation next stage after drying of herbal raw materials is:
a. Processing by insecticides
b. Storage
c. Labelling
d. Packaging
e. Lyophilization

12. During storage of dried herbal raw materials it is necessary to fallow certain requirements including shelf life. Shelf life of inflorescence should not exceed:
a. 1 year
b. 2 years
c. 3 years
d. 5 years
e. 10 years

13. Fruits and seeds are picked mainly after ripening. Part of harvest is left for seeds innovation in quantity of:
a. 15-20%
b. 25-30%
c. 35-40%
d. 45-50%
e. Depends on the raw materials

14. Leaves of live plants are gathered prior to large flowering. Exception is plants which bloom when leaves are underdeveloped. Choose such plant from the list below:
a. *Chamomilla recutita*
b. *Eleutherococcus senticosus*
c. *Menyanthes trifoliata*
d. *Scutellaria baicalensis*
e. *Mentha piperita*

15. Raw materials of such species as *Valeriana officinalis, Lavandula, Origanum vulgare, Melissa officinalis, Mentha piperita, Artemisia absinthium, Thymus, Carum carvi, Anethum graveolen* and *Salvia* temperature:
a. 35-40 °C
b. 50-60 °C
c. 70-90 °C
d. Not exceed 25 °C
e. No lower 40 °C

31. In order to prevent vitamin C destruction in raw materials it is necessary to
a. Dry raw materials in temperature 80-90 °C
b. Spread raw materials by thin layer and dry in room temperature
c. Dry slowly, temperature should not exceeded 30-35 °C
d. Cut into small pieces and dry on shelves under sheds in temperature 16 °C
e. Dry slowly in temperature 50-60°C

32. Volatile oils containing plants raw materials should:
a. be closed water and air proof
b. be dried slowly. Temperature should not exceed 30 °C
c. be dried fast in temperature 80-90 °C
d. should be dried fast under the Sun
e. should be frozen after gathering

33. Mark the maximal shelf life of Bistorta officinalis rhizome:
a. 3 years
b. 4 years
c. 5 years
d. 6 years
e. 15 years

34. The highest level of alkaloids in plants can be found:
a. At the beginning of vegetation
b. After fruiting
c. During flowering
d. During maturing of seeds
e. During fruiting

35. In case of drying of medicinal plants / raw materials of medicinal plants these should be placed by thin layer. Which raw materials are dried by thickened layer or in bundles?
a. *Papaver somniferum*
b. *Capsella bursa-pastoris*
c. *Tussilago farfara*
d. *Urtica dioica*
e. *Origanum vulgare*

officinalis are dried slowly in temperature:
   a. According to raw materials
   b. 20-25 °C
   c. 30-35 °C
   d. 40-45 °C
   e. 50-60 °C

16. Raw materials of *Hyoscyamus niger, Consolida regalis, Chelidonium majus, Ephedra distachya* are dried normally in temperature:
   a. 20-25 °C
   b. 30-35 °C
   c. 40-45 °C
   d. 50-60 °C
   e. 80-90 °C

17. Gatherers of medicinal plants / medicinal plants raw materials should be instructed against all aspects of gathering and protection. Which persons are not allowed to gather?
a. Those who do not have health card
b. Individuals with infection diseases
c. Under age persons
d. Individuals who are not citizens of country
e. All listed above

18. It is necessary to take precautions against unfavorable consequences for medicinal plants / medicinal plants raw materials when gathering them in increased humidity conditions. Notably:
a. Avoiding contact with soil
b. Should be processed fresh
c. Should not be packed in transport container
d. Raw materials should be gathered ante meridiem
e. Raw materials should be gathered post meridiem

19. Collective fruit of *Alnus* and berries of *Juniperus* should be gathered:
   a. Only in autumn
   b. In spring and summer
   c. In winter and spring
   d. In autumn and winter
   e. In spring

20. In order to avoid quality impact frozen raw materials of medicinal plants should be kept in temperature lower then:
a. - 6 °C
b. - 8 °C
c. -10 °C
d. -16 °C
e. -18 °C

36. Preparation of cortex of *Frangula alnus* is carried out:
   a. During flowering
   b. During fruits formation
   c. Late autumn
   d. During spring juice movement
   e. During any season

37. In order to save populations during preparation of annual herbs and perennial herbs … of plants should be left in the area limits:
   a. not exceed 5 %
   b. not below 50 %
   c. not below 20 %
   d. not exceed 10 %
   e. not below 40 %

38. Leaves of *Primula*, fruits of Rosa contain ascorbic acid and other vitamins. In order to preserve their oxidation the raw materials are dried in temperature:
   a. 40-50 ^{0}C
   b. 50-60 ^{0}C
   c. 60-70 ^{0}C
   d. 70-90 ^{0}C
   e. Above 100 ^{0}C

39. It is recommended to dry alkaloid containing plants raw materials in temperature 40-50 °C. Choose plants which belong to these group:
   a. *Plantago major*
   b. *Arnica montana*
   c. *Chelidonium majus*
   d. *Urtica dioica*
   e. *Glycyrrhiza glabra*

40. Which type of medicinal plants raw materials should be spread by very thin layer (not exceed 1 cm)?
   a. Leaves
   b. Herbs
   c. Flowers
   d. Seeds
   e. Gemmae

TOPIC 9.

Protection of medicinal plants in different European countries and in Ukraine. Legal regulation of using, preservation and accounting of resources of medicinal plants in Ukraine.

Purpose: to examine priorities of using and preservation of medicinal plants in the world and in Ukraine.

to know: rational methods of collecting raw herbs; foundations of international and national legislation for the protection and using of medicinal plants; medicinal plants of Ukraine, which are protected at international, national and local levels; basic natural preserved objects in Ukraine.

to be able to: control collecting and periodicity of blanks medicinal plants; know in national and international law on the using and protection medicinal plants; identification of rare and endangered plant species.

Educational objectives

Task 1. Make a list of herbs that included to the Red Book of Ukraine and specify the raw materials used.

№	Medical plants	Raw materials	Status
1.			**RB**
2.			
3.			
4.			
5.			

Task 2. Make a list of herbs that is protected on regional level and needs protection on regional level and specify the raw materials used.

№	Medical plants	Raw materials	Status
1.			

2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

Task 3. Make a list of fungi which have status «Endangered» and «Vulnerable», «Extinct».

№	Fungi	Status
1.		
2.		
3.		
4.		
5.		
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7.		
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11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		

Task 4. Make a list of lichens which have status «Endangered» and «Vulnerable».

№	Lichens	Status
1.		
2.		
3.		
4.		

5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		

Signature of teacher _____

PRACTICE TESTS

1. IUCN Red List of Threatened species is:
a. Legal document mandatory for implementation in all countries
b. Recommended to implementation list of species
c. Electronic list of protected species advisable to implementation
d. Recommended paper list of biocenosis
e. Recommended electronic list of biocenosis

2. Which of the listed below international legal documentation related to protection and sustainable use of the plant kingdom resources has been adopted by Ukraine?
a. The Convention on Biological Diversity
b. The Convention on sale limitation of plants and animal raw materials
c. The Convention on protection of natural

21. *The main tasks of Ministry of Ecology and Natural Resources of Ukraine in protection and regulation of plant kingdom use are:
a. Keeping of state record, cadaster and monitoring of plant kingdom;
b. Society control in protection, use and renovation of plant kingdom;
c. Record of natural plant resources
d. Implementation of normative legal regulations regarding plant kingdom use;
e. State control of adherence of legal requirements regarding usage and protection of natural plant resources

22. Arrangement of limits of plant kingdom natural resources use is carried out for a term of:
a. 1 year

groups
d. International agreement on usage of medicinal and aromatic plants
e. International agreement on restriction of unfavorable consequences of biotechnology

3. 64 species of Ukraine flora are mentioned in the Appendix I of Convention on the Conservation of European Wildlife and Natural Habitats, 43 of those are listed in The Red Book of Ukraine (1996) including:
a. *Cotinus coggigria*
b. *Eleutherococcus senticosus*
c. *Menyanthes trifoliata*
d. *Scutellaria baicalensis*
e. *Paeonia tenuifolia*

4. International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) has been prepared in order to:
a. Stop illegal turnover of phyto preparations
b. Stop the over usage
c. Standardize the raw materials quality
d. Promote development of use of phyto preparations
e. Control of natural resources use participants

5. The basic categories regarding grant of safeguard status are developed for International Union for Conservation of Nature (IUC). Which of the listed below medicinal plants of Ukraine belong to rare category «Not Evaluated»?
a. *Hyoscyamus niger*
b. *Vinca minor*
c. *Cynara scolymus*
d. *Huperzia selago*
e. *Rauvolfia serpentine*

6. According to safeguard status IUC *Astragalus dasyanthus, Gentiana lutea, Paeonia tenuifolia, Glaucium flavum, Atropa belladonna* belong to:
a. EN (Endangered)
b. VU (Vulnerable)
c. LR (Lower Risk)
d. NE (Not Evaluated)
e. CR (Critically Endangered)

7. Mark the species that are under the regional protection in all areas of Ukraine:
a. *Polemonium caeruleum*
b. *Alnus glutinosa*
c. *Cotinus coggigria*
d. *Centaurea cyanus*
e. *Lamium album*

8. The main body of executive authority on medicinal plants resources use regulation in Ukraine is:
a. Ministry of Health of Ukraine
b. State Forestry Committee of Ukraine
c. Ministry of Ecology and Natural Resources of Ukraine
d. State Committee of Land Economy
b. 2-3 years
c. 5 years
d. 5-10 years
e. 20 years

23. United quality standards of medicinal products quality implemented in EU on the base of:
a. Pharmaceutical Inspection Convention
b. European Pharmacopoea
c. World Health Organization
d. European Pharmacopoeia Convention
e. All above

24. Mark the species that are under the regional protection in all areas of Ukraine:
a. *Tussilago farfara*
b. *Hypericum perforatum*
c. *Polemonium caeruleum*
d. *Platycladus orientalis*
e. *Polygonum aviculare*

25. According to safeguard status IUC *Huperzia selago, Adonis vernalis, Scopolia carniolica* belong to:
a. EN (Endangered)
b. VU (Vulnerable)
c. LR (Lower Risk)
d. NE (Not Evaluated)
e. CR (Critically Endangered)

26. Mark natural plant resources of local importance:
a. Rare and Critically Endangered
b. Not listed in resources of country importance
c. Forest resources of country importance
d. Natural and biosphere reserve
e. National parks

27. Picking of medicinal plants included to Red Book of Ukraine:
a. Allowed in case of adherence to raw picking regulations
b. Is allowed for payment
c. Banned
d. Is allowed only to legal entities
e. Is allowed to individuals

28. *Special use of natural plan resources is carried out:
a. According to special licenses
b. Without following rules of raw picking
c. For a fee
d. Without a fee
e. For satisfaction of own needs

29. Mark plants species presented in State Pharmacopoea of Ukraine included to Red Book of Ukraine:
a. *Arnica montana, Frangula alnus*
b. *Mentha longifolia, Thymus serpyllum*
c. *Valeriana officinalis,Convallaria majalis,*
d. *Glycyrrhiza glabra, Atropa belladonna*
e. *Urtica dioica, Tussilago farfara*

e. State cadaster of plant kingdom

9. Which of listed below items is not included to «general use of wild plants raw materials» conception?
a. Is paid
b. Subjects of right of use are individuals
c. The purposes of use are defined by law
d. Lack of special license
e. Without payment

10. Which characteristic is forecasted volumes of permissible resources use of defined plants species defined as a result their resource evaluation at the administrative region territory?
a. Limits of use of medicinal plants (MP)
b. Normative of use of MP resources
c. Cadaster of plant kingdom
d. Biological reserve
e. Useful resource.

11. The red book of International Union for Conservation of Nature, IUCN is
a. Legal document
b. Recommended paper list of species
c. Electronic list of protected species advisable to implementation
d. Recommended paper list of biocenosis
e. Recommended electronic list of biocenosis

12. Which of the listed below international legal documentation related to protection and sustainable use of the plant kingdom resources has been adopted by Ukraine?
a. The Convention on Biological Diversity
b. The Convention on sale limitation of plants and animal raw materials
c. The Convention on protection of natural groups
d. International agreement on usage of medicinal and aromatic plants
e. International agreement on restriction of unfavorable consequences of biotechnology

13. 64 species of Ukraine flora are mentioned in the Appendix I of Convention on the Conservation of European Wildlife and Natural Habitats, 43 of those are listed in The Red Book of Ukraine (1996) including:
a. *Agrimonia eupatoria*
b. *Ledum palustre*
c. *Silybum marianum*
d. *Colchicum fominii*
e. *Silybum marianum*

14. International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) has been prepared in order to:
a. Control of natural resources use participants
b. Standardize the raw materials quality
c. Stop illegal turnover of phyto preparations
d. Promote development of use of phyto preparations
e. Stop the illegal harvest and trade of wild

30. International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) has been prepared in order to:
a. Quality control of wild medicinal plants raw materials
b. Protection of rare plants
c. Regulation of processing of wild plants raw materials
d. Getting information regarding raw resources of wild medicinal plants in different countries
e. Discontinuance of over exploitation and illegal trade of wild medicinal plants.

31. According to Law of Ukraine «On plant world» natural plant resources can be divided into:
a. Resources of wild, resources of cultivated plant
b. Vegetational resources of nationwide and local importance
c. Vegetational resources of general and special use
d. Resources of typical and rare plant groups
e. Resources of tracheal and cryptogamous plants

32. Which characteristic is real volume of acceptable use of defined plant species resources taking into consideration change of resources state in the previous year?
a. Biologic reserve
b. Useful resource
c. Cadaster of plant world
d. Limits of medicinal plants use
e. Standards of use of medicinal plants resources

33. Convention on protection of wild flora and fauna and natural habitat in Europe regulates:
a. Protection of plants and their natural habitat
b. Trade of medicinal plants raw materials
c. Plants cultivation
d. Quality of raw materials
e. All above

34. The Red Book of Ukraine (2009) includes:
a. 50 species of medicinal plants
b. 102 species of medicinal plants
c. 170 species of medicinal plants
d. 202 species of medicinal plants
e. 322 species of medicinal plants

35. Which of listed below species of medicinal plants are protected by the state level and included in the Red Book of Ukraine?
a. *Mentha longifolia, Atropa belladonna, Archangelica officinalis*
b. *Valeriana officinalis,Crataegus, Leonurus quinquelobatus*
c. *Gentiana lutea, Glycyrrhiza glabra, Adonis vernalis*
d. *Arnica montana, Frangula alnus, Ledum palustre*
e. *Coryllus avellana, Frangula alnus, Betula pendula*

36. The next species are under regional protection in all parts of Ukraine:

medicinal plants

15. Which of the listed below medicinal plants of Ukraine belong to rare category of IUC List «Not Evaluated»?
a. *Panax ginseng*
b. *Colchicum autumnale*
c. *Rauvolfia serpentina*
d. *Chelidonium majus*
e. *Drosera rotundifolia*

16. According to safeguard status IUC *Lycopodium annotinum, Taxus baccata, Oxycoccus microcarpus, Rhodiola rosea* belong to:
a. CR (Critically Endangered)
b. EN (Endangered)
c. VU (Vulnerable)
d. LR (Lower Risk)
e. NE (Not Evaluated)

17. Mark the species that are under the regional protection in all areas of Ukraine:
a. *Scutellaria baicalensis*
b. *Eleutherococcus senticosus*
c. *Tussilago farfara*
d. *Ledum palustre*
e. *Mentha piperita*

18. The main legal requirements of record, usage and maintenance of wild medicinal and food plants are defined by Law of Ukraine:
a. On Nature Reserve Fund of Ukraine
b. On plants world
c. On Protection of the Natural Environment
d. On Red Book of Ukraine
e. On turnover of raw of wild medicinal plants species

19. Special use of wild plants raw materials is:
a. Free
b. For a manufacturing needs
c. Subjects of use license are individuals and legal entities
d. For profit earning
e. For a science needs

20. *According to main requirements of the Law of Ukraine «On Plant World» wild plant resources are divided into natural plats resources:
a. Society importance
b. National importance
c. Local importance
d. Private importance
e. Regional importance

a. *Hypericum perforatum*
b. *Polemonium caeruleum*
c. *Adonis vernalis*
d. *Centaurium erythraea*
e. *Achillea millefolium*

37. Tracheal species plants of Ukraine which included as a rare regional species in some regions and there are massive resources of that plants in the others:
a. *Vaccinium vitis-idaea, Sambucus nigra*
b. *Platanus orientalis, Hypericum perforatum,*
c. *Convallaria majalis, Alnus incana;*
d. *Pinus sylvestris, Betula pendula*
e. *Gleditsia triacanthos, Quercus robur*

38. Choose in the protected objects class list below those, where it is allowed to use of plants in defined season and in certain level without harm:
a. Wildlife preserve
b. Forest reserve
c. National park
d. Biosphere park
e. Natural park

39. *Special use of natural plant resources is carried out:
a. In order to get profit from realization of that resources of products of processing
b. For satisfaction of own needs
c. Without any license
d. According to special license
e. Without a fee

40. The mail legal rules of keeping, use and preservation of wild species of medicinal and food plants are defined by the Law of Ukraine:
a. On Nature Reserve Fund of Ukraine
b. On plants protection
c. On Protection of the Natural Environment
d. On Red Book of Ukraine
e. On plants world

Topic 10.

Accounting of resources of MP: methods of accounting resources of medicinal plants. Stages accounting resources of medicinal plants.

Purpose: learn the basic methods of accounting resources of medicinal plants.

to know: methods of accounting resources of medicinal plants; distribution of medicinal plants in Ukraine sequence of the accounting resources of MP.

to be able to: orient in priorities of resources accounting; determine the distribution of certain species and raw herbs zone by informational materials; establish potentially raw areas for certain species; give an assessment the state of natural resources of particular MP species.

Educational objectives

Task 1. Study the features of processing raw materials at research resources in the region.

Task 2. Writing a list of raw materials that are needed for processing in compiling plan of accounting MP resources.

Task 3. Describe the state of a certain species of resources and using of raw materials in pharmaceutical industry.

Species _____

Raw materials _____

State of natural resource _____

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Use of raw material of MP_____

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Signature of teacher _____

PRACTICE TESTS

1. In order to define a raw reserve density by projective cover method the mean value of raw mass with 1 % of projective cover multiply by:
    a. Arithmetical mean
    b. Arithmetical mean error
    c. Mean projective cover
    d. Dispersion
    e. Useful resources
2. Filling in summary lists of analysis of medicinal plants resources in the region is conducted:
    a. During resources record
    b. During expedition period
    c. During reconnaissance period
    d. After finishing of resources record
    e. During laboratory work
3. The method of model specimen is optimal for evaluation of a raw reserve density of:
    a. *Achillea millefolium*
    b. *Sambucus nigra*
    c. *Vaccinium*
    d. *Polygonum*
    e. *Thymus vulgaris*
4. In order to regulate the size of use of medicinal plants resources at the local level the resources evaluation of these species is carried out in limits of:
    a. Terrestrial ecosystems
    b. Forestry lands
    c. Lands of nation-wide importance
    d. Administrative units (oblast)
    e. All above
5. Evaluation of plants resources using extrapolation is carried out for:
    a. Cultivated species of medicinal plants
    b. Plants species with sharply evident ecologo-coenotic belonging
    c. Plant species which grow isolated
    d. Plants, which underground organs are used
    e. Plants, which overground organs are used
6. Discount areas are filled to:
    a. Define an area of a raw area
    b. Calculate the quantity of plant species
    c. Define the weight of an investigated species raw
    d. Define the ecological condition of growing of investigated plants
    e. Calculation of raw specimen
7. In order to find biological raw reserve by the method of model specimen it is necessary to know the next values:
21. Mark the first initial step of the medicinal plants resources record:
    a. Recording
    b. Reconnoitering
    c. Laboratory work
    d. Expeditionary
    e. Field
22. Medicinal plants resources record in field conditions is conducted during:
    a. Initial step
    b. Laboratory work
    c. Preparation step
    d. Expeditionary step
    e. Final step
23. In order to find a raw reserve density by the method of model specimen the next data should be known:
    a. Value of area of thicket and a raw reserve density of an investigated area
    b. Value of area and mean projective cover
    c. Cost of 1 % and value of area
    d. Quantity of marketable specimens and a raw weight of a model specimen
    e. The area of registration territory and area of an industrial massif
24. The main data values to identify the biological raw reserve are:
    a. Data of ecologo-coenotic belonging
    b. Weight of a one single specimen and area of phytocenosis
    c. Raw reserve density and area of raw massif
    d. Quantity of all plants per 1 hectare
    e. Quantity of all plants in the raw massif and area of that massif
25. The unit of measure of the raw reserve density is:
    a. kg/m^2
    b. years
    c. %
    d. kg
    e. m
26. The next factor is influence at the size of record areas which are used in order to define the raw reserve density:
    a. Value of area
    b. Total quantity of plants in the area
    c. Size of the plants
    d. Type / species of medicinal plant raw material
    e. Homogeneous allocation of medical plants in the thickets

a. Period of renovation of thicket and possible annual volume of stocking
b. Quantity of stored areas and average quantity of specimens in the defined area
c. Quantity of stored areas and mean quantity of plants per 1 m^2
d. Volume of thicket and useful resources
e. Quantity of plants and mean weight of one plant

8. Projective cover method is used in order to record resources of plants species which:
   a. Grow sporadicly
   b. Form a thick brushwood
   c. For water plants
   d. For wood plants
   e. Underground parts are used
9. Which method is used in order to define the density of raw reserve of *Hypericum perforatum*?
   a. Model specimen
   b. Projective cover method
   c. Key area
   d. Record area
   e. Transect
10. It is necessary to make an evaluation of *Helichrysum arenarium* raw stock in the thicket. Which method of assessment of raw density reserves should be used?
   a. Record area
   b. Model specimen
   c. Projective cover method
   d. Field experiment
   e. Reconnoitering
11. Product of quantity of raw specimens by mean raw weight of the same model specimen (the method of model specimen) is
   a. Crop yields (capacity)
   b. Biological reserve
   c. Volume of annual stocking
   d. Useful resource
   e. Density of raw reserve
12. In order to record resources by the projective cover method it is necessary to find projective cover of medicinal plants. The projective cover is:
   a. The area of projection of underground parts of plants per unit area
   b. The area of projection of underground and outground parts of plants in the limits of total area
   c. The area of projection of outground parts of plants at the ground surface
   d. The area of outground part of a single plant
   e. The area of registration territory
27. In order to record *Thymus vulgaris* resources it is reasonable to use the next method:
   a. Geodesic
   b. Model specimen method
   c. Photometric method
   d. Projective cover
   e. Transect
28. In order to record *Crataegus* resources it is reasonable to use the next method:
   a. Record area method
   b. Model specimen method
   c. Projective cover method
   d. By sight
   e. Transect
29. The size of test areas are established depending on morphological particularly and spacing of an investigated species. Test area of middle and tall herbaceous plants which rarely form a homogenous tangle equals:
   a. 10-20 m^2
   b. 50-100 m^2
   c. 100-500 m^2
   d. 1 000 m^2
   e. 10 000 m^2
30. Basic information for resource investigation planning of medicinal plants includes:
   a. Statistical data on harvesting of medicinal plants raw materials
   b. Data of forest and land management
   c. Data of primary record of plant resource
   d. Herbarium materials
   e. All listed above
31. Which of the listed below methods is not used for evaluation of medicinal plants resources:
   a. Model specimen method
   b. Record area method
   c. The projective cover method
   d. Transect method
   e. Chromatography method
32. Mark the stage of record of medicinal plant resources when the analyze of starting material is carried out:
   a. Initial step
   b. Laboratory work
   c. Expeditionary step
   d. Field
   e. Final step
33. In order to find a raw reserve density by the projective cover method the next data should be known:
   a. Value of area of thicket and a raw reserve density of an investigated area
   b. Cost of 1 % and medium projective cover

13. The analyze of resources use of investigated regions is carried out:
    a. During resources record
    b. During preparation period
    c. During of process of resource record data tabulation in defined region
    d. After finalizing of resource record
    e. During laboratory work
14. In order to reduce of time loss during *Hypericum perforatum* resource record the density of raw reserve can be found without cutting and weighting of medicinal plant raw materials. For this purpose is used:
    a. Record area method
    b. Transect method
    c. Projective cover method
    d. Model specimen method
    e. Express method
15. The projective cover method is optimal for assessment of the raw reserve density of:
    a. *Viburnum opulus*
    b. *Thymus vulgaris*
    c. *Aralia elata*
    d. *Pinus sylvestris*
    e. *Frangula alnus*
16. The projective cover method is not used to record of resources of:
    a. Trees
    b. Shrubs
    c. Subshrubs
    d. Groundling plants
    e. Herbaceous plants
17. Suggest the method of the density raw reserve evaluation of a tall herbaceous plant such as *Bidens tripartita:*
    a. The record area method
    b. The model specimen method
    c. The discount area method
    d. The projective cover method
    e. Any of listed above
18. The model specimen method is used to resources record of the next plant species:
    a. If overground parts are used
    b. Which form dense thickets
    c. Which grow singly
    d. For water plants
    e. For herbaceous plants
19. Maximal due date use of trees resources evaluation results is:
    a. 3 years
    b. 5 years
    c. 7 years
    d. 10 years
    e. 15 years
20. It is necessary to make an evaluation of *Origanum vulgare* raw stock in the thicket. Which method of assessment of raw density
    c. Value of area and a raw weight of a model specimen
    d. Quantity of model specimens and a raw weight of a model specimen
    e. The raw weight of a model specimen
34. The unit of measure of the projective cover of plants is:
    a. g/m^2
    b. Hectare
    c. %
    d. kg
    e. cm
35. Quantity of a raw mass which is produced by phytocenosis during certain time per area unit is called:
    a. Productivity
    b. Size of stocking
    c. Raw materials production
    d. Raw material density of resource
    e. Raw reserve density
36. In order to record *Vaccinium vitis-idaea* resources it is reasonable to use the next method:
    a. Geodesic
    b. Projective cover
    c. Model specimen
    d. Photometric
    e. Transect
37. Medicinal products containing *Valeriana* are used as a sedative drug. Raw reserve if *Valeriana* is identified:
    a. By sight
    b. The discount area method
    c. The projective cover method
    d. Model specimen method
    e. Photometric method
38. The maximal terms of use of herbaceous plants resources evaluation results equals:
    a. 3 years
    b. 5 years
    c. 7 years
    d. 10 years
    e. 15 years
39. The area of registration territory to bushes, middle and tall herbaceous plants which rarely forms homogenous thicket is:
    a. 0,25 m^2
    b. 0,5 m^2
    c. 1-10 m^2
    d. 20-40 m^2
    e. 100-500 m^2
40. In order to find the raw reserve density of some medicinal plants, notably *Achillea millefolium, Convallaria majalis* without cutting and weighting of medicinal plant raw materials the next method can be used:

reserves should be used?

a. Record area
b. Model specimen
c. Projective cover
d. Field experiment
e. Reconnoitering

a. Express-method
b. Record area method
c. Transect method
d. Projective cover method
e. Model specimen method.

Topic 11.

Determination of the biological, the operating reserve and the amount of acceptable use of raw materials. Solving tasks on the definition of reserve of wild MP.

Purpose: learn the basic mechanisms of determining the possibilities of using raw materials from the environment

to know: concepts: biological reserves, operating reserve, possible amount of annual harvesting; rules for drafting the summary information on resource inspection of the region.

to be able to: count biological, operating reserve, possible amount of annual harvesting; determine the amount of acceptable usage of medicinal raw materialsmake a summary statement on the resource inspection of the region; make recommendations for the balanced use resources of medicinal plants specific region.

Educational objectives

Task 1. Calculate operational reserve of raw material in determining the method of accounting plots.

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Task 2. Calculate biological reserve, operating reserve, usage possible annual amount.

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Task 3. Make recommendations for the balanced use resources of medicinal plants of the region.

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Signature of teacher _____

ADDITIONS
I. The main medical plants of *Asteraceae*

Species	The main active ingredients	Action	Presence of raw materials in Ukraine
Arnica montana	sesquiterpenes, furocoumarins	choleretic, antipyretic, tonic, sedative	–
Cynara cardunculus	phenolic acid, tsinarin	choleretic and hepatoprotective agent	k
Centaurea cyanus	anthocyanins, flavonoids	diuretic, anti-inflammatory, antimicrobial effect	+
Achillea millefolium	essential oil, flavonoids	tonic, anti-inflammatory, hemostatic, antiseptic, astringent and weak local anesthetic effect	+
Echinaceae purpurea	polysaccharides, phenolic compounds and glycosides	antiseptic analgesic property	k
Taraxacum officinale	carbohydrates, triterpenoids	diuretic, laxative and antispasmodic properties, sedative and hypnotic	+
Calendula officinalis	flavonoids, carotenoids	anti-inflammatory, antibacterial, antispasmodic, hypotensive, cardiotonic and sedative properties, increases the metabolic function of the liver	k
Artemisia absinthium	essential oil, bitter glycosides, sesquiterpenes	anti-inflammatory, antiseptic, anthelmintic properties, stimulates appetite, reflex stimulates the glands of the alimentary canal	+
Silybum marianum	flavolignans	hepatoprotector, antioxidant action	k
Chamomilla recutita	essential oil, sesquiterpenes	expectorant, antibacterial and sedative	+, k
Cichorium intybus	fructosan, bitter glycosides, acid phenolcarbonic	helps to normalize metabolism, excretion of excess cholesterol, stimulates the digestive glands, has choleretic, anti-inflammatory, binding, sedative and cardiotonic, antitumor effect	+, k
Helichrysum arenarium	flavones, bitters, tannins, essential oil	bile secretion, anti-inflammatory, antibacterial and antispasmodic effect, stimulate the secretory function of the stomach and pancreas, increase diuresis, act as a hemostatic	+, k

The main medical plants of *Brassicaceae*

Species	The main active ingredients	Action	Presence of raw materials in Ukraine
Capsella bursa-pastoris	vitamins, flavonoids, organic acids	hypotensive, antipyretic, choleretic, astringent, diuretic and styptic strong action	+
Erysimum diffusum	cardiac glycosides	diuretic, expectorant, the lung disease	+, k
Brassica juncea	thio glycosides, fatty oil	anti-inflammatory and antimicrobial agents	–

The main medical plants of *Apiaceae*

Species	The main active ingredients	Action	Presence of raw materials in Ukraine
Conium maculatum	alkaloids of pyridine group	**The plant is deadly poisonous!** sedative	+
Archangelica officinalis	essential oil, bitter and tannins, resins, carbohydrates, organic acids	anti-inflammatory, antispasmodic, diuretic, diaphoretic and sedative properties	–
Daucus carota	organic acids, tannins, alkaloids	anthelmintic and laxative, diuretic, choleretic, antispasmodic, anti-inflammatory and antimicrobial properties	+

The main medical plants of *Lamiaceae*

Species	The main active ingredients	Action	Presence of raw materials in Ukraine
Betonica officinalis	terpenoids and phenolic compounds, phenolcarbonic acids and their derivatives, flavonoids	anti-inflammatory, expectorant, choleretic, diuretic, laxative properties	+
Hyssopus officinalis	essential oil, oleanolic and ursolic acids, tannins	antiseptic and antispasmodic properties	k

Lavandula angustifolia	essential oil, coumarin, fatty and organic acids, tannins	sedative effect, choleretic	k
Origanum vulgare	essential oil, tannins, flavonoids	sedative, antispasmodic, expectorant and diaphoretic strong action	+, k
Melissa officinalis	essential oil, tannins, resins, organic acids	sedative	k
Mentha aquatica, M. longifolia, M. piperita	essential oil, vitamin C, flavonoids, organic acids, tannins	anti-inflammatory, antispasmodic, analgesic, sedative, diuretic, anticonvulsant, diaphoretic, tonic and hemostatic effect, enhances intestinal motility and capillary circulation	k
Leonurus cardiaca	flavonoids, tannins, essential oil, protoalkaloids, vitamins	antispasmodic, sedative and antihypertensive properties, slow heart rate, increase the strength of heart contractions, detected a weak diuretic effect, regulate the menstrual cycle and functions of the digestive system	+, k
Thymus serphyllum	essential oil, tannins, flavonoids	anesthetics; expectorant; antispasmodic	k
Salvia officinalis	flavonoids, tannins, terpenoids	inflammatory and disinfectant action	k

The main medical plants of *Fabaceae*

Species	The main active ingredients	Action	Presence of raw materials in Ukraine
Astragalus dasyanthus	flavonoids of cycloartans group, kaempferol, quercetin, izoramnetyn triterpene saponins	sedative and hypotensive properties, stimulate the expansion of the coronary vessels, have diuretic properties and also dilate blood vessels of the kidneys	o
Melilotus albus, M. offcfinalis	phenolcarbonic acid, coumarin, essential oils, flavonoids	antispasmodic, expectorant, anti-coagulation and fibrinolytic effect	+
Ononis arvensis	isoflavones, phenolcarbonic acid, coumarin	laxatives, diuretics, hemostatic, antihypertensive, anti-inflammatory and cardiotonic properties	+, k
Galega officinalis	alkaloids, saponins, tannins, flavonoids	diaphoretic, anthelminthic	+, k
Robinia pseudoacacia	derivatives of hydroxycinnamic acid, coumarin, flavonoids, essential oil	antispasmodic, astringent and antipyretic	+

Sophora japonica	flavonoids, rutin, kaempferol-3-soforozyd, genistein and genistein-3-soforozyd	restored the elasticity of blood vessels, reduces their fragility; cleaned vascular wall; normalize metabolic processes in the body, resulting in reduced levels of cholesterol and glucose in blood; strengthens the immune system; reduced stress on the heart; reduces swelling of joints and tissues	+, k
Glycyrrhiza glabra	triterpene glycosides, flavonoids, pectin	expectorant, laxative and antispasmodic properties	o

The main medical plants of *Rosaceae*

Species	The main active ingredients	Action	Presence of raw materials in Ukraine
Crataegus	flavonoids, phenolic acid, coumarins, triterpene acids	cardiotonic, antispasmodic, hypotensive, sedative and desensitizing properties	+
Rosa	vitamins, carbohydrates, flavonoids, catechins, tannins	soothing, antimicrobial, astringent, anti-inflammatory, hemostatic, diuretic and regulates the gastrointestinal tract effects	+
Filipendula ulmaria	vitamin C, salicylic aldehyde, phenol glycosides, tannins	diaphoretic, diuretic, astringent, styptic and disinfectant action	+
Agrimonia eupatoria	bitterness, vitamins, steroid saponins, flavonoids	astringent and diuretic properties, stimulate appetite and reflex increase the secretion of digestive glands, help to normalize metabolism, exhibit hemostatic properties and weak choleretic	+
Potentilla anserina	tannins, flavonoids	antiseptic, analgesic, hemostatic, analgesic, astringent, diuretic, anticonvulsant, tonic and choleretic properties	+
Potentilla erecta	tannins, triterpenoids and triterpene saponins, ellagic acid	anti-inflammatory, astringent, antibacterial, hemostatic action	+. k
Sanguisorba officinalis	tannins, triterpenoids, steroids, phenolcarbonic acids and their derivatives, chromone, proanthocyanidins	vasoconstrictor, astringent, anti-inflammatory, analgesic and hemostatic properties	+
Fragaria vesca	phenolic compounds, vitamins, oksykorychni acids, flavonoids, tannins,	hemostatic, diuretic, antiseptic properties	+

	gallic and ellagic acid, aromatic compounds		

K – is cultivated for raw materials; + – natural resources are sufficient for use; – – natural resources are limited; o – is protected species.

II.

All cultures from ancient times to the present day have used plants as a source of medicines. Today, according to the World Health Organization (WHO), as many as 80% of the world's people depend on traditional medicine for their primary health care needs. The greater part of traditional therapy involves the use of plant extracts or their active principles.

According with classification system of WHO medical plants divides into 3 group:

1. Medical plants that are used directly for treatment
2. Medical plants that are used for the production of herbal medicines
3. Medical plants that are the raw material for industrial production or for the production of biologically active substances, which are used for production of medications.

More than 25 % pharmaceutical products that are used in the world today are derived from plant natural products.

In Europe uses about 2,000 species of medicinal plants, including raw materials 1200-1300 species is removed from the environment.

Diversity of medicinal plants in different countries

Countries	**Plants**	**Medical plants**
China	32200	4941
India	18664	3000
Indonesia	22500	1000
Malaysia	15500	1200
Nepal	6973	700
Pakistan	4950	300

Philippines	8931	850
Sri Lanka	3314	550
Thailand	11625	1800
USA	21641	2564
Vietnam	10500	1800
Ukraine	6086	2219
Poland	2468	500
Bulgaria	3567	770
Croatia	4288	180
Romania	3297	800
Hungary	2214	270
World in general	422000	52885

III. Terms and storing, harvesting of medicinal raw materials

№	Medical plants	Types of raw materials	The maximum storage time, years	Months of collection of raw materials
1.	*Acorua calamus*	rhizomes	3	September – October
2.	*Althaea officinalis*	roots	3	April, August-November
3.	*Ledum palustre*	grass (shoot)	2	June
4.	*Vinca minor*	grass	2	May-June
5.	*Atropa bella-donna*	leaves, grass, roots	2	June-August
6.	*Betula*	buds	2	January-March
7.	*Menyanthes trifoliata*	leaves	2	June-July
8.	*Vaccinium vitis-idaea*	leaves	3	March-November
9.	*Sambucus nigra*	Flowers fruits	3 2	May-June November-January
10.	*Melilotus officinalis*	grass	2	June-August
11.	*Valeriana*	Rhizomes with roots	3	April-May, August-October

12.	*Alnus*	cones	3	January-April
13.	*Ononis arvensis*	roots	3	September-October
14.	*Centaurea cyanus*	flowers	1	June-August
15.	*Crataegus*	Flowers Fruits	1 2	May-June August-October
16.	*Polygonum hydropiper*	grass	2	June-August
17.	*Polygonum bistorta*	rhizomes	6	August-September
18.	*Polygonum persicaria*	grass	2	June-August
19.	*Polygonum aviculare*	grass	3	June-September
20.	*Nuphar lutea*	Rhizomes	2	November-January
21.	*Sorbus aucuparia*	fruits	2	September-December
22.	*Capsella bursa-pastoris*	grass	3	May-August
23.	*Achillea*	Grass, flowers	2	June-August
24.	*Verbascum*	flowers	1	July-August
25.	*Quercus robur*	bark	5	April-May
26.	*Angelica sylvestis*	Rhizomes with roots	2	August-September
27.	*Datura stramonium*	leaves	2	June-August
28.	*Rhamnus cathartica*	fruits	4	August-October
29.	*Hypericum perforatum*	grass	3	June-July
30.	*Centaurium erythraea*	grass	2	June-August
31.	*Viburnum opulus*	bark	4	March-May
32.	*Convallaria majalis*	Grass, leaves flowers	1 1	May-June May
33.	*Urtica dioica*	leaves	2	June-August
34.	*Frangula alnus*	bark	5	April-May
35.	*Taraxacum officinale*	roots	5	August-September
36.	*Zea majus*	columns	3	June-September
37.	*Tilia cordata*	flowers	2	June-July
38.	*Arcticum lappa*	roots	-	March-April, September-October
39.	*Origanum vulgare*	grass	1	June-August
40.	*Rubus idaeus*	fruits	2	June-July

IV.

International cooperation in the environmental protection carried out on a global (world), regional (example, European, Pacific) and national levels.

The content of international activities in the protection and sustainable use of plants resources including medicinal plants develops in the following areas:

- International protection of rare species
- establishing of rational and environmentally sustainable usage of natural resources of plants on the national and international levels
- the regulation of international trade of plants (including their raw materials).

Threats to resources of medicinal and aromatic plants in the world include:

- excessive exploitation of natural resources
- destructive methods of timber harvesting and land use
- violation of ecological balance and loss of habitat species (mainly due to excessive anthropogenic transformation of habitats over the past 100-200 years).

Increasing of diversity and in international trade by raw of wild medicinal plants also is a threat to their resources, especially in developing countries.

Nowadays at the international level actively develops environmental legislation in order to regulate use and trade by raw of wild plants at the international and national levels: develops and implements legal acts, evaluation criteria and the lists of rare species.

International Union for Conservation of Nature and Natural Recourses (IUCN) in 1963 initiated the creation of the International Red List of species of animals and plants threatened with extinction. Today the International Red List IUCN is a volumetric e-database, access to which is open in on-line (http://www.iucnredlist.org). On the site can view information about the status and state of species and read the definitions of categories and criteria IUCN.

Assessment of (and reassessment) taxon status conducted on a regular basis, the average intervals of several years: the last «full-scale» review of lists took place in 2013. The process of entering and evaluation of taxon performed by

panels of experts which are responsible for a taxonomic group or a particular geographic region.

Red Book IUCN and Red List IUCN are not legal documents and are recommendatory in nature.

Directly related or dedicated to the protection and sustainable use of resources of flora such International legal documents acceded by Ukraine:

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora, which are under threat of destruction (CITES, 1973).
- Convention on the Conservation of European Wildlife and Natural Habitats (Berne Convention, 1979).
- The Convention on Biological Diversity (1992).

International cooperation in international trading of rare and endangered plants species is based on The Convention on International Trade in Endangered Species of Wild Fauna and Flora, which are under threat of destruction (1973). CITES is an international governmental agreement signed as a result of the resolution of the International Union for Conservation of Nature (IUCN), also known as the Washington Convention. It entered into force on 1 July 1975, today its members are 175 states. The Convention adopted three Appendixes. Appendix I contains a list of species that are endangered, trade by which makes them the existence of adverse effects. In Appendix II are listed species that can appear in danger of extinction if their trade is not strictly controlled. In Annex III is listed species which trade must be controlled. The Convention establishes general rules of state regulation of trade of rare species of fauna and flora. In these annexes are absent species of medicinal plants, raw materials are officially used with the environment in Ukraine, although many existing species of medicinal plants around the world.

Convention on the Conservation of European Wildlife and Natural Habitats is aimed to protect wild flora and fauna and their natural habitats, especially those species and habitats, protection of which requires the cooperation of several states, and facilitate such cooperation. Particular attention is paid to species, endangered and vulnerable species.

In the flora of Ukraine from the list of species in Annex I of the Berne Convention, there are 64 species, of which 43 are listed in the Red Book of Ukraine (1996), including medicinal plants: *Colchicum fominii, Cyclamen kuznetzovii, Paeonia tenuifolia, Pulsatilla patens, Salvinia natans, Narcissus angustifolius, Trapa natan*s, species of *Orchidaceae*.

The objectives of the Convention on Biological Diversity is the conservation of biological diversity, the sustainable use of its components and joint receiving on fair and equitable benefits associated with the use of genetic resources. States define the components of biological diversity, taking measures for their conservation and sustainable use, and assess actions to minimize adverse effects, regulate the use of biotechnology and other.

Taking into account main provisions of the Conventions in 1993 in Geneva 9 international organizations have decided to establish an international non-governmental organization called International Council on medicinal and aromatic plants in order to promote mutual understanding and cooperation between national and international organizations in the field of medicinal and aromatic plants in science, medicine and industry, to improve the exchange of information between them. The council coordinates and promotes cooperation between partners by providing a forum for mobilizing the ideas, actions, discussions, long-term concepts and measures in the field of education and training in all areas connected with medicinal plants.

In 2008 proposed a non-governmental international organization «International Standard for Sustainable Use (collection) of wild medicinal and aromatic plants» (ISSC-MAP).

The basic idea of sustainable use is that biological resources to be collected within the capabilities of self-healing.

The main objective of ISSC-MAP is:

- stop excessive exploitation
- stop illegal collection and trafficking of wild herbs

- through an effective system to promote non-extinctive collection of raw materials in the wild particularly in developing countries.

Basic to provide species conservation status is category designed for the Red List of the International Union for Conservation of Nature, which are not identical categories of the Red Book of Ukraine.

Entry of species to Red List IUCN conducted according to following categories.

Extinct – EX – no doubt that all individuals extinct within the world.

Extinct in the Wild – EW – individual species (or populations fragments) preserved only in culture or artificial housing.

Critically Endangered – CR – for them there is a high danger of extinction in nature in the near future, which is defined by the following characteristics: distribution of populations limited 10–100 km^2 and observation during 10 years or three generations of time individuals confirm that intensity reduction is 80% populations.

Endangered – EN – for their probable high risk of extinction in nature in the near future, which is determined by measuring the spread within the 500-5000 km^2, and observations that indicate that during 10 years or three generations of time individuals intensity reduction is 50 % populations.

Vulnerable – VU – for them established high risk of extinction in nature in the future, as the total area of distribution is 2000-20000 km^2 and observations indicate a decrease over 10 years time or three generations of individuals to 20 % the number of populations. For interpretation of Ukrainian legislation to category «Vulnerable» include species that in the near future can be classified as endangered if negative factors will impact on their populations. In most cases, the reason for becoming «vulnerable» species of plants is critical violations or loss of their habitat (biotopes) and weak stress-adaptive properties of populations.

To this category of medicinal plants Ukraine belong: *Lycopodium annotinum, Juniperus excelsa, Pinus cembra, Taxus baccata, Leucojum aestivum, Narcissus angustifolius, Gladiolus imbricatus, Rhodiola rosea, Oxycoccus*

microcarpus, Astragalus dasyanthus, Gentiana lutea, Paeonia daurica, Paeonia tenuifolia, Glaucium flavum, Pulsatilla patens, Atropa belladonna and some less known medicinal plants.

The category of rarity «invaluable» include herbs: *Allium ursinum, Huperzia selago, Salvinia natans, Galantus nivalis, Leucojum vernum, Colchicum autumnale, Lilium martagon, Glycyrrhiza glabra, Adonis vernalis, Adonis wolgensis, Pulsatilla pratensis, Scopolan carniolica, Trapa natans*.

Species with low risk of extinction – Ir (Lower Risk) – includes three subcategories:

- **cd (Conservation Dependent) –** to be protection localities and habitats where species exist or it is protected to determine the degree of threat of extinction, and enrollment in the previous categories.
- **nt (Near Thretened)** which does not belong to the category of dependent protection but nearing vulnerable.
- **Lc (Least concern)** does not belong to previous sub-categories, but showed a trend reduction of its population in many countries.

There are two categories of rare species for which there is not enough information or not assessed. As Ukrainian interpretation is available category of «not known» that can't be assigned to any of the above categories because of an absence of reliable information.

The list of species and the degree of rarity of medicinal plants is different in some countries. 150 species of medicinal plants in Europe are under threat of extinction due to excessive use. In most EU countries under threat of depletion of natural resources are: *Adonis vernalis, Arctostaphylos uva-ursi, Arnica montana, Cetraria islandica, Drosera rotundifolia, Gentiana lutea, Glycyrrhiza glabra, Menyanthes trifoliata, Gypsophila* spp., *Paeonia* spp., *Sideritis* spp., *Thymus* spp., *Origanum* spp., species of *Orchidaceae* family.

Adonis vernalis nowadays extinct in Italy and Netherlands and is an endangered species in Germany, Slovakia, Sweden and Switzerland. Using of natural resources of this species is limited or is not allowed in the EU, it is

included in the list of species whose use is governed by CITES. Species is included in the Red Book of Ukraine (2009) in connection with the development trends in the depletion of natural resources due to plowing, over-pasture, terracing and forestation of slopes, operational load.

Arnica montana is listed in the European Red List species that are subject to conservation and national red lists, although it distributed in almost all European countries, from Norway to the Balkans and from Spain to Ukraine. It is endemic species, populations of which react negatively to human pressure. In Germany, Lithuania, Slovenia, Bosnia and Herzegovina and Croatia, it is classified as a vulnerable species (by international classification). In France, the species is protected in some regions (Aquitaine, Centre, Bourgogne) and more than 5 departments. Hungary is classified as a species extinct in the wild.

In Ukraine *Arnica montana* was included to the Red Book of Ukraine (1996) but wasn't include to the last edition in 2009 due to a decrease of anthropogenic impact on its habitats in the Ukrainian Carpathians.

To European Red List included *Ledum palustre* as a species populations of which are reduced by more than 30% within 10 years. For these reasons it is classified as Least Concern. The main cause of reduction resources of this species is irreversible changes in ecological conditions of its habitat.

Centaurium erythraea and *Centaurium pulchellum* also included to the Red list of categories Least Concern. They are widespread in Europe, but intensive pasture load on meadow in the group with the presence of these species is a threat to the depletion of their populations.

In Poland, the list of medicinal plants that are under strict protection, has about 20 species of herb, including *Adonis vernalis, Atropa belladonna, Archagelica officinalis, Arnica montana, Colchicum autumnale, Galantus nivalis, Nymphaea alba, Nuphar luteum, Polemonium coeruleum, Leucoium vernum, Hierochloe odorata,* some species of *Drosera* spp, *Gentiana* spp., *Lycopodium* spp., *Veratrum* spp. To partially protection include: *Cetraria islandica, Ononis spinosa, Frangula alnus, Ledum palustre, Viburnum opulus, Arctostaphylos uva-*

ursi, Polypodium vulgare, Asarum europaeum, Primula officinalis, Asperula odorata, Gentiana asclepiadea, Helichrysum arenarium, Convallaria majalis and others.

In Ukraine under state protection (the Red Book) are about 200 species of vascular medicinal plants, the most famous of them: *Atropa belladonna, Allium ursinum, Adonis vernalis, Adonis wolgensis, Astragalus dasyanthus, Galanthus nivalis, Gentiana lutea, Glaucium flavum, Glycyrrhiza glabra, Huperzia selago, Lycopodium annotinum, Paeonia tenuifolia, Rhodiola rosea, Scopolia carniolica, Taxus baccata.*

In Romania, the legislation prohibited the use raw materials from the environment of *Acorus calamus, Angelica archangelica, Arctostahylos uva-ursi, Arnica montana, Centaurium erythrea, Leucojum vernum, Gentiana lutea*.

In the EU the collection and sale of raw rare plants is prohibited. In some countries (Albania, Romania) may be dosed collection of some rare raw materials in some regions.

List of Fungi in the Red Book of Ukraine

№	Species	Status
1.	*Leucocoprinus bohusi* Wasser	EN
2.	*Leucocortinarius bulbiger* (Alb. et Schwein.: Fr.) Singer	RARE
3.	*Leucoagaricus nympharum* (Kalchbr.) Bon	RARE
4.	*Leucoagaricus macrorhizus* Locq. ex Horak	EN
5.	*Leucoagaricus moseri* (Wasser) Wasser	RARE
6.	*Boletus aereus* Bull	VU
7.	*Boletus regius* Krombh	EN
8.	*Phallus duplicatus* Bosc	EN
9.	*Galeropsis desertorum* Velen. et Dvor	EN
10.	*Helvella monachella* (Scop.) Fr.	RARE
11.	*Hericium coralloides* (Fr.) Gray	VU
12.	*Hygrocybe calyptriformis* (Berk. et Broome) Fayod	RARE
13.	*Gomphus clavatus* (Pers: Fr.) Gray	EN
14.	*Grifola frondosa* (Dicks.: Fr.) Gray	VU
15.	*Entoloma nidorosum* (Fr.) Quél.	RARE
16.	*Morchella steppicola* Zerova	RARE
17.	*Morchella crassipes* (Vent.) Pers	RARE

18.	*Pseudocolus fusiformis* (E. Fischer) Lloyd	RARE
19.	*Catathelasma imperiale* (Fr.) Sing.	RARE
20.	*Anthurus archeri* (Berk.) Fischer	EN
21.	*Clavariadelphus pistillaris* (L.) Donk	RARE
22.	*Crepidotus macedonicus* Pilöt	VU
23.	*Sparassis crispa* (Wulfen) Fr.	EN
24.	*Lycoperdon mammaeforme* Pers.	VU
25.	*Limacella steppicola* Zerova et Wasser	DATA DEFICIENT
26.	*Lyophyllum favrei* (R. Haller Aar. et R. Haller Suhr)	EN
27.	*Myriostoma coliforme* (With.: Pers.) Corda	RARE
28.	*Laricifomes officinalis* (Vill.: Fr.) Kotl. et Pouzar	EX
29.	*Boletus parasiticus* Fr.	RARE
30.	*Mutinus ravenelii* (Berk. et M.A. Curtis) E. Fish	RARE
31.	*Mutinus caninus* (Huds.) Fr.	RARE
32.	*Amanita caesarea* (Scop.) Pers.	EN
33.	*Amanita solitaria* (Bull.) Fr.	EN
34.	*Agaricus amanitaeformis* Wasser	EN
35.	*Agaricus romagnesii* Wasser	EN
36.	*Agaricus tabularis* Peck	EN
37.	*Pisolithus arrhizus* (Scop.: Pers.) S. Rauschert	RARE
38.	*Bovista paludosa* Láv.	EN
39.	*Clathrus ruber* Pers. (C. cancellatus Fr.)	RARE
40.	*Tricholoma colossus* (Fr.) Quel.	RARE
41.	*Tricholoma focale* (Fr.) Ricken	VU
42.	*Sarcosoma globosum* (Schmidel) Rehm	RARE
43.	*Paxillus zerovae* Wasser	EN
44.	*Russula turci* Bres.	VU
45.	*Scleroderma geaster* Fr.	DATA DEFICIENT
46.	*Gyromitra slonevskii* Heluta	RARE
47.	*Polyporus umbellatus* (Pers.) Fr.	RARE
48.	*Polyporus rhizophilus* (Pat.) Sacc.	RARE
49.	*Tuber aestivum* Vitt	EN
50.	*Phellorinia herculeana* (Pers.) Kreisel	DATA DEFICIENT
51.	*Phaeolepiota aurea* (Matt.) Maire	VU
52.	*Phylloporus pelletieri* (Luv. apud Crouan)	EN
53.	*Floccularia rickenii* (Bohus) Wasser	VU
54.	*Lactarius chrysorrheus* Fr.	VU
55.	*Lactarius sanguifluus* (Paulet) Fr.	VU

List of lichens in the Red Book of Ukraine

№	Species	Status
1.	*Agrestia hispida* (Mereschk.) Hale & W.L. Culb.	VU
2.	*Alectoria sarmentosa* (Ach.) Ach.	VU
3.	*Allocetraria oakesiana* (Tuck.) Randlane & Thell	RARE
4.	*Aspicilia vagans* Oxner	VU
5.	*Aspicilia fruticulosa* (Eversm.) Flag	VU
6.	*Belonia herculina* (Rehm ex Lojka) Hazsl	VU
7.	*Gyalecta truncigena* (Ach.) Hepp	RARE
8.	*Dactylina madreporiformis* (Ach.) Tuck.	RARE
9.	*Dolichousnea longissima* (Ach.) Articus	VU
10.	*Cladonia stellaris* (Opiz.) Brodo	RARE
11.	*Xanthoparmelia ryssolea* (Ach.) O. Blanco et al.	VU
12.	*Xanthoparmelia convoluta* (Krempelh.) Hale	VU
13.	*Lasallia pustulata* (L.) Merat	RARE
14.	*Lasallia rossica* (Wallroth) J.Groves	RARE
15.	*Lecanora reuteri* (Trevis.) Scharer	RARE
16.	*Leptogium schraderi* (Ach.) Nyl.	VU
17.	*Leptogium saturninum* (Dicks.) Nyl.	VU
18.	*Leptogium imbricatum* P. Jorg.	VU
19.	*Lethariella intricata* (Moris) Krog	EN
20.	*Leucocarpia biatorella* (Arnold) Vezda	EN
21.	*Lichenomphalia hudsoniana* (H.S. Jenn.) Redhead, Lutzoni, Moncalvo & Vilgaly	RARE
22.	*Lobaria pulmonaria* (L.) Hoffm.	VU
23.	*Lobaria amplissima* (Scop.) Forss	VU
24.	*Melanohalea elegantula* (Zahlbr.) O. Blanco et al.	RARE
25.	*Nephroma resupinatum* (L.) Ach.	VU
26.	*Nephroma parile* Ach.	VU
27.	*Dactylorhiza romana* (Sebast.) Soy	VU
28.	*Parmeliella triptophylla* (Ach.) Müll. Arg.	RARE
29.	*Parmotrema perlata* (Huds.) M. Choisy	RARE
30.	*Ramalina canariensis* Steiner	RARE
31.	*Ramalina pontica* Vězda	EN
32.	*Ramalina lacera* (With.) J.R. Laundon	RARE
33.	*Rhizoplaca melanophtalma* (Ramond) Leuckert & Poelt	RARE
34.	*Roccella phycopsis* (Ach.)	RARE
35.	*Rusavskia digitata* (S. Kondr.) S. Kondr. & Kärnef.	EN
36.	*Seirophora contortuplicata* (Ach.) Froden	RARE
37.	*Seirophora lacunosa* (Rupr.) Froden	VU
38.	*Squamarina periculosa* (Schaerer) Poelt	VU
39.	*Squamarina lentigera* (G. H. Weber) Poelt	VU

40.	*Squamarina cartilaginea* (With.) P. James in D. Hawksw. et al.	RARE
41.	*Solorina bispora* Nyl.	VU
42.	*Solorina saccata* (L.) Ach.	VU
43.	*Sticta fuliginosa* (Dicks.) Ach	VU
44.	*Sticta sylvatica* (Huds.) Ach.	VU
45.	*Thamnolia vermicularis* (Sw.) Schaer.	VU
46.	*Tuckneraria laureri* (Krempelh.) Randlane & Thell	RARE
47.	*Umbilicaria subpolyphylla* Oxn.	RARE
48.	*Usnea florida* (L.) Web. in Wigg.	VU
49.	*Fulgensia desertorum* (Tomin) Poelt	EN
50.	*Cetraria steppae* (Savicz) Kärnef.	VU

V. PRACTICE TESTS OF PHARMACOGNOSY (KROK)

1. Thymol is the main component of *Thymus serpyllum* essential oil. What is the time of harvesting for this raw herbal material?

A. Peak florescence period

B. In autumn after above-ground part of a plant dies-off

C. During peak of sap movement

D. During fruiting

E. Beginning of vegetation

2. Intoxication cases were observed during harvesting raw herbal material containing potent and toxic substances. What raw herbal material SHOULD NOT be harvested by underage and pregnant?

A. Celandine grass

B. Walnut leaves

C. Valerian rootstock

D. Buckthorn bark

E. Blueberries

3. Sage leaves procured for the production of essential oil should be dried at a temperature of:

A. 25-30o

C B. 50-60o C

C. 100o C

D. 60-70o C

E. 70-80o C

4. Leaves of greater plantain are harvested in summer by mowing or cutting

48. One of the methods of quantitative analysis of active substances in the raw material is the biological standardization. It can be applied with the following group of biologically active substances:

A. Cardiac gliycosides

B. Alkaloids

C. Fatty oils

D. Tannins

E. Mucilages

49. Cardioglycosides of *Adonis vernalis* are used for heart failure treatment. This plant raw material should be stored:

A. According to the list B

B. According to the list A

C. Under normal conditions

D. Protected from CO2

E. In metal containers

50. Fatty oil containing unsaturated fatty acids are used for atherosclerosis prevention. What herbal raw material contains such fatty oil?

A. Cucurbit seeds

B. Buckhorn plantain (*Plantago lanceolata*) seeds

C. Chestnut (Castanea) seeds

D. Parsnip fruitages

E. Scurfy pea (Psoralea) fruitages

51. A patient came to a pharmacy to

them with a knife or a sickle. There is always one developed plant left per 1 m2. The plant is harvested in the following vegetation period

A. Blooming
B. Budding
C. Rosetting
D. Beginning of fruiting
E. Ripeness

5. Admixtures can get into the herbal raw material during harvesting, drying and primary processing. Mineral admixtures include:

A. Sand, earth, stones
B. Metal objects
C. Other similar plants
D. Droppings of birds and rodents
E. Other organs of the same plant

6. Raw herbal material with the following features was delivered to a laboratory for analysis: fine flat glossy egg-shaped seeds (one end is sharp, other - rounded). Seed surface is smooth, vary in colour from pale yellow to brown, has pale yellow raphe. No smell is detected. The taste is slimy and oily. Name this raw herbal material.

A. Flax seeds
B. Pumpkin seeds
C. Plantago psyllium
D. Strophanthus seeds
E. Peanut seeds

7. Plantaglucide is used to treat peptic ulcer disease of stomach and duodenum with normal acidity and hypoacidity. This drug is obtained from the following plant:

A. *Plantago major*
B. *Plantago psyllium*
C. *Plantago media*
D. *Plantago stepposa*
E. *Plantago lanceolata*

8. Plantain leaves are used for production of Plantaglucidum which has antiulcerogenic action. The plant material analysis involves quantitative determination of the following class of compounds:

A. Polysaccharides
B. Vitamins
C. Amarines
D. Terpenes
E. Carotenoids

purchase cowberry leaves. Which of the available herbal raw materials can be offered as a substitute?

A. Folium Uvae ursi
B. Rizoma Calami
C. Rizoma et radix Sanquisorbae officinalis
D. Herba Achilleae millefolii
E. Radix Taraxaci officinalis

52. A student has been prescribed a tonic. This may be the tincture of the following medicinal plant:

A. Rhodiola rosea
B. Common yarrow
C. Java tea (orthosiphon aristatus)
D. Purple foxglove
E. Black locust

53. Coumarins are natural compounds with their structure based on an benzo-alpha-pyrone skeleton. What reaction allows to detect this group of compounds?

A. Lactone test
B. Cyanide test
C. Iron (III) chloride reaction
D. Wilson's reaction
E. Trim-Hill reagent

54. Ammi furinum contains furocumarines. These biologically active substances are derived from:

A. Fruits of large ammi
B. Fruits of psoralea
C. Fruits of common parsnip
D. Fruits of toothpick ammi
E. Rhizomes and roots of angelica

55. Preparations made of ginseng roots have tonic and adaptogenic properties, improve mental and physical performance. If the ginseng tincture cannot be found in a pharmacy, it can be substituted by the analogous preparations made of the following raw material:

A. Radices Eleutherococci
B. Radices Valerianae
C. Radices Inulae
D. Radices Ononidis
E. Radices Rhei

56. Fruits of holy thistle (Silybum) are used for production of a number of domestic

9. Leaves of greater plantain are harvested in summer by mowing or cutting them with a knife or a sickle. There is always one developed plant left per 1 m2. The plant is harvested in the following vegetation period:

A. Blooming
B. Budding
C. Rosetting
D. Beginning of fruiting
E. Ripeness

10. The possible admixture in the crop of raw coltsfoot leaves (Tussilago farfara) is the leaf of:

A. Cotton burdock (*Arctium tomentosum*)
B. Common plantain
C. Nettle
D. Marshmallow (*Althaea officinalis*)
E. Primula officinalis

11. A pharmacy depot received a batch of common plantain leaves. According to the requirements of the Pharmacopoeia, this herbal raw matrial is of adequate quality if it contains the following active substances

A. Polysaccharides
B. Flavonoids
C. Tannins
D. Anthracene derivatives
E. Essential oils

12. Coltsfoot preparations are used for upper airways treatment. During procurement of this herbal raw material the following admixture may appear:

A. Great bur (*Arctium lappa*)
B. Common plantain (*Plantago major*)
C. Spring adonis (*Adonis vernalis*)
D. Marsh mallow (*Althaea officinalis*)
E. Pot marjoram (*Origanum vulgare*)

13. Upper airways diseases can be treated by means of herbal raw materials containing mucilages. The plant source of this compound class is:

A. Radix Althaeae
B. Radix Inulae
C. Radix Ipecacuanhae
D. Radix Rhodiolae
E. Radix Belladonnae

and foreign hepatoprotective drugs. Factor of merit of this raw material is content of:

A. Flavolignans
B. Cumarins
C. Alkaloids
D. Vitamins
E. Terpenoids

57. Preparations of sorrel roots can have both laxative and astringent effect. Such an effect results from the presence of the following biologically active substances:

A. Anthracene derivatives and tannins
B. Flavonoids and essential oils
C. Essential and fatty oils
D. Coumarins and phenol glycosides
E. Iridoids and vitamins

58. Anthracene derivatives of emodin have purgative effect. Large quantities of anthracene-derived groups of emodin are contained in the fruits of the following plant:

A. Buckthorn
B. Elder (Sambucus)
C. Blackcurrant
D. Blueberry (Vaccinium myrtillus)
E. Alder buckthorn (Frangula alnus)

59. Tannins can be used as an antidote for alkaloid poisoning. What herbal remedy should be applied in case of such intoxication:

A. Cinquefoil root
B. Calamus rhizome
C. Althaea root
D. Rhizome and roots of madder
E. Elecampane root

60. Tannins have astringent effect and are used for treatment of colitis, enterocolitis, diarrhea. What herbal raw material contains a lot of tannins?

A. Fructus Myrtilli
B. Fructus Sambucci nigri
C. Fructus Ribes nigri
D. Fructus Rhamni catharticae
E. Fructus Frangulae

61. Tanning agents of silverweed roots and rhizomes are used as an astringent. What species of silverweed is pharmacopoeial?

A. *Potentilla erecta*
B. *Potentilla argentea*

14. A storehouse received a batch of althaea roots. For its verification a drop of ammonia solution was applied upon the root section; the spot of section turned yellow. This is the evidence of presence of the following substance:

A. Mucilages
B. Tannins
C. Gum
D. Pectins
E. Vitamin C

15. Stinging nettle (Urtica dioica) leaves are mostly used as a hemostatic in tinctures and liquid extract to treat lung, intestinal, and uterine hemorrhages. What bioactive substance provides hemostatic effect?

A. Vitamin K
B. Beta-carotene
C. Rutin
D. Reserpine
E. Digitoxin

16. The following fruit was received for analysis: succulent drupes circular or elongated-ellipsoid in shape, 4–12 mm in length. The colour of fruit varies from yellow to dark orange. The smell is faint. The taste is sour-sweet. What plant is it?

A. *Hippophae rhamnoides*
B. *Ammi majus*
C. *Aronia melanocarpa*
D. *Vaccinium myrtillus*
E. *Coriandrum sativum*

17. Pharmaceutical warehouse received a batch of herbal raw material of cinnamon rose. Under the State Pharmacopoeia, it is required to test this raw material for the following active substances:

A. Ascorbic acid
B. Flavonoids
C. Tannins
D. Anthracene derivatives
E. Essential oil

18. Fatty oils containing unsaturated fatty acids are used for the prophylaxis of atherosclerosis. Specify the starting materials of herbal origin that contain fatty oil:

A. Pumpkin seed
B. Ispaghula seed
C. *Potentilla pilosa*
D. *Potentilla impolita*
E. *Potentilla anserina*

62. A phytochemical department of a pharmaceutical factory produces biogenic stimulators out of different raw materials. Specify the plant-derived biogenic stimulators:

A. Liquid extract of aloe, aloe liniment, aloe juice, biosedum
B. Liquid extract of aloe, peloidinum, biosedum juice
C. Peloidinum, humisolum, torfotum, Fibs pro injectionibus
D. Vitreous body, Suspesio Placetae pro injectionibus, aloe juice, biosedum
E. Peloidinum, humisolum, torfotum, plasmol, solcoseryl

63. A patient with heart failure induced by long-term coronary vessel disorder can be administered a drug produced out of the following raw herbal material:

A. Hawthorn berries
B. Calendula flowers
C. Ginseng roots
D. Aralia roots
E. Berberis roots

64. The main active components of hawthorn berries are flavonoids. What is their pharmacological effect?

A. Hypotensive and sedative
B. Laxative and sedative
C. Tonic and antispasmodic
D. Diuretic and styptic
E. Antispasmodic and antiinflammatory

65. A laboratory received some raw herbal material for analysis. The plant had flowerheads up to 4 cm in diameter, marginal flowers were agamic, blue, funnel-shaped; the inner flowers were bisexual, purple, tubular. What plant has these features?

A. *Centaurea cyanus*
B. *Solidago virgaurea*
C. *Polygonum persicaria*
D. *Scutellaria baicalensis*
E. *Viola tricolor*

66. A laboratory received some raw herbal material for analysis. The plant had

C. Chestnut seed
D. Parsnip fruits
E. Psoralea fruits

19. Fatty oil containing saturated fatty acids is used for atherosclerosis prevention. Specify the medicinal plant that is used for oil production:
A. Flax seeds
B. Fennelflower seeds
C. Dill seeds
D. Black chokeberry fruits
E. Hawthorn fruits

20. The following raw herbal material was delivered for analysis: capitulum inflorescence is semicircular or conic in shape; no pedicles or only their remains; floral disk is naked, conic, hollow. Semiflorets are white, disk florets are yellow, involucres are yellow-green. The smell is speci- fic, aromatic. The taste is bitter-spicy. What raw herbal material is it? A. Flores Chamomillae
B. Flores Arnicae
C. Flores Calendulae
D. Flores Helichrysi arenarii
E. Flores Millefolii

21. Thymol is the main component of *Thymus serpyllum* essential oil. What is the time of harvesting for this raw herbal material?
A. Peak florescence period
B. In autumn after above-ground part of a plant dies-off
C. During peak of sap movement
D. During fruiting
E. Beginning of vegetation

22. An essential oil is a component of such compound drugs as: Inhalypt, Corvalol, Pinosol, Corvaldin, tooth drops. What raw herbal material is a source of this essential oil?
A. Folia Menthae piperitae
B. Folia Betulae
C. Folia Urticae
D. Folia Agavae
E. Folia Absinthii

23. Yellow gentian contains bitter glycosides. Raw material of this plant is recommended for production of drugs with the following effect:

flowerheads up to 4 cm in diameter, marginal flowers were agamic, blue, funnel-shaped; the inner flowers were bisexual, purple, tubular. What plant has these features?
A. *Centaurea cyanus*
B. *Solidago virgaurea*
C. *Polygonum persicaria*
D. *Scutellaria baicalensis*
E. *Viola tricolor*

67. Patients with heart failure caused by persisting cardiac and coronary vessel dysfunction can be recommended preparations produced from the following herbal raw material:
A. Hawthorn fruits
B. Calendula flowers
C. Ginseng roots
D. Aralia roots
E. Barberry roots

68. Rutin exhibits P-vitamin activity. What medicinal plant is used as starting materials for the industrial production of rutin?
A. Fructus Sophorae japonicae
B. Fructus Hippophaes rhamnoides
C. Flores Helichrysi arenarii
D. Herba Bidentis tripartitae
E. Herba Polygoni avicularis

69. Under the SPhU (appendix 2), leaves of ginkgo are standardized by the content of:
A. Flavonoids
B. Saponins
C. Alkaloids
D. Coumarins
E. Chromones

70. Field horsetail grass is recommend as a diuretic. What herbal material can be used as a substitute?
A. Herba Aervae lanatae
B. Herba Leonuri
C. Herba Menthae piperitae
D. Herba Convallariae
E. Herba Adonidis

71. A pharmacy has no quinquelobate motherwort in stock. It can be substituted by the following herbal material:
A. Rhizomes and roots of valerian

A. Stimulates appetite
B. Tonic
C. Diuretic
D. Hepatoprotective
E. Venotonic

24. A pharmacy received a prescription for tincture. What raw herbal material can be used to make this dosage form?
A. Valerian rootstock
B. Rhubarb roots
C. Oak bark
D. Arrow-wood bark
E. Buckthorn bark

25. Thymol is the main component of *Thymus serpyllum* essential oil. What is the time of harvesting for this raw herbal material?
A. Peak florescence period
B. In autumn after above-ground part of a plant dies-off
C. During peak of sap movement
D. During fruiting
E. Beginning of vegetation

26. A teenager with hyporexia has been recommended to drink medicinal herbal tea of the following composition: Herba Absinthii, Herba Millefolii. Specify the characteristic microscopic features of *Artemisia absinthium*, which indicate its presence in the herb mixture:
A. T-shaped hairs along the leaf edge
B. Simple and capitate hairs
C. Branched, simple and ciliated hairs
D. Retor-shaped hairs
E. Branched and capitate hairs

27. Menthol has anesthetic and antiseptic effect. What plant is the source of menthol?
A. Folia Menthae piperitae
B. Folia Uvae ursi
C. Folia Eucalypti
D. Folia Salviae
E. Folia Absinthii

28. Thyme grass is used for production of herbal medical products for treatment of respiratory tract infections. Under the State Pharmacopoeis of Ukraine, the raw herbal material is subject to chromatographic identification by means of thin-layer
B. Linden flowers
C. Beggarticks grass
D. Raspberry fruits
E. Hypericum grass

72. A drug raw material from the family Polygonaceae had been sent to a laboratory for analysis. On macroscopic examination the material was identified as a herbaceous plant with lanceolate leaves with a red spot, and filmy ocreae covered with appressed hairs. The plant had the apical inflorescence in dense spicate panicles. What plant is it?
A. Redshank (persicaria)
B. Common knotweed
C. Biting knotweed
D. Snakeweed
E. Common buckwheat

73. Some domestic and foreign hepatoprotective activity preparation are made of holy thistle bearing. Purity of this material is determined by the content of:
A. Flavolignan
B. Coumarins
C. Alkaloids
D. Vitamins
E. Terpenoids

74. Specify which of the alkaloids given below will react positively to xanthines (murexide test):
A. Caffeine
B. Atropine sulfate
C. Papaverine hydrochloride
D. Quinine sulfate
E. Ephedrine hydrochloride

75. Bellasthesin is a spasmolytic drug used in treatment of gastrointestinal diseases. What substance contained in Atropa Belladonna provides such an effect of the drug?
A. Hyoscyamine
B. Morphine
C. Codeine
D. Reserpine
E. Caffeine

76. Bellasthesin is a spasmolytic drug used in treatment of gastrointestinal diseases. What substance contained in Atropa

chromatography. What substances are detected on the chromatographic plate after its treatment with due reagent?

A. Thymol and carvacrol
B. Atropine and hyoscyamine
C. Quercetin and rutin
D. Apigenin and luteolin
E. Arbutin and methyl arbutin

29. Sage leaves procured for the production of essential oil should be dried at a temperature of:

A. 25–30^0 C
B. 50–60^0 C
C. 100^0 C
D. 60–70^0 C
E. 70–800 C

30. After harvesting the calamus rhizomes the received material should be dried. What temperature range is required for obtaining good-quality raw material?

A. 35–40^0 C
B. 40–60^0 C
C. 60–70^0 C
D. 70–80^0 C
E. 80–90^0 C

31. A pharmacy has no quinquelobate motherwort in stock. It can be substituted by the following herbal material:

A. Rhizomes and roots of valerian
B. Linden flowers
C. Beggarticks grass
D. Raspberry fruits
E. Hypericum grass

32. Flower buds of clove contain the essential oil used for production of herbal antiseptics. Under the State Pharmacopoeia of Ukraine, the raw materials are identified by the method of thin layer chromatography. What zones can be identified on the chromatographic plate after their treatment with reagent?

A. Eugenol and caryophyllene
B. Quercetin and rutin
C. Hyoscyamine and scopolamine
D. Apigenin and luteolin
E. Scopoletin and umbeliferon

33. A pharmacy procured common origanum. What drying conditions should be

Belladonna provides such an effect of the drug?

A. Hyoscyamine
B. Morphine
C. Codeine
D. Reserpine
E. Caffeine

77. Vitali-Morin's reaction is used to identify tropane alkaloids in raw herbal material. Name the alkaloid that can be detected by this specific reaction.

A. Scopolamine
B. Codeine
C. Morphine
D. Platyphyllin
E. Papaverine

78. Medications Passit and Novopassit are used as tranquilizing, sedative and mild soporific agents. These medications are produced from the following grass:

A. Purple passionflower
B. Three-lobe beggarticks
C. Garden sage
D. Elecampane
E. Lesser periwinkle

79. Intoxication cases were observed during harvesting raw herbal material containing potent and toxic substances. What raw herbal material SHOULD NOT be harvested by underage and pregnant?

A. Celandine grass
B. Walnut leaves
C. Valerian rootstock
D. Buckthorn bark
E. Blueberries

80. Choose the substance that is a tropane-derived alkaloid:

A. Cocaine
B. Caffeine
C. Strychnine
D. Pilocarpine
E. Platyphyllin

81. One of the packagings stored at the warehouse of finished products has a damaged label. It is known that the drug substance in this packaging relates to alkaloids. In course of group qualitative tests for alkaloids the drug

applied for producing high quality crude drug?

A. 35−40^0 C
B. 80−90^0 C
C. 60−70^0 C
D. 50−60^0 C
E. 70−80^0 C

34. Calamus rhizome is likely to be confused with some other plant rhizome that can be found as an admixture in the herbal raw material. Specify the most likely admixture:

A. Iris rhizome
B. Valerian rhizome
C. Elecampane roots
D. Althaea roots
E. Phlojodicarpus roots

35. A biennial or perennial plant from the *Apiaceae* family has a blue-grey stem branching in its lower part. Its leaves are also blue-grey, finely dissected, with the ultimate filiform segments. The flowers are yellow, in compound umbels. Its fruit is used for production of «dill water». What plant is it?

A. *Foeniculum vulgare*
B. *Carum carvi*
C. *Petroselium crispum*
D. *Coriandrum sativum*
E. *Conium maculatum*

36. Common juniper is applied as a diuretic, anti-inflammatory and cholagogic agent. This plant gives the following medicinal raw material:

A. Fruits
B. Sprouts
C. Leaves
D. Roots
E. Seeds

37. One of the ways to derive essential oil is enfleurage, or maceration. Essential oil can be derived by enfleurage from the following herbal raw material:

A. Petals of Damascus rose
B. Lemon skin
C. Coriander fruits
D. Mint leaves
E. Camomile flowers

38. A dispensing chemist can recommend a drug made from seeds of substance reacted positively with murexide. Further identification of the drug substance should be limited to the following group of derivatives:

A. Purine
B. Quinoline
C. Tropane
D. Isoquinoline
E. Indole

82. What herbal drug produced form alkaloid-containing raw materials can be recommended for neurasthenia, insomnia, menopausal disorders?

A. Novopassit
B. Ergotamine
C. Glaucine hydrochloride
D. Securinine nitrate
E. Vinblastine

83. Vincamine alkaloid reduces blood pressure, has a pronounced sedation effect, as well as hemostatic and anti-inflammatory effect. What herb is the source of this alkaloid?

A. Common periwinkle
B. Thick-fruited pagoda tree
C. Bluish larkspur
D. Northern wolfsbane
E. Yellow water-lily

84. Alkaloid glaucine has an antitussive effect that is stronger and longer if compared to that of codeine, and exhibits no narcotic side effects. What medicinal plant contains glaucine?

A. Yellow hornpoppy
B. Celandine
C. Thermopsis lanceolata
D. Datura
E. Henbane bell (Scopolia carniolica)

85. A certain plant is used for production of tinctures and extracts which are the part of complex drugs Bellataminal, Becarbon, Besalol, etc. Specify the grass that is used for this purpose:

A. Belladonna
B. Lily of the valley
C. Astragalus
D. Beggarticks
E. Celandine

Aesculus hippocastanum to be taken as a veintonic and antithrombotic agent to treat venous congestion and veins dilatation of lower extremities. This drug is:

A. Aescusan
B. Phytolysin
C. Flamin
D. Marelin
E. Ajmaline

39. Drug plant Dioscorea nipponica is the starting materials for the production of Polysponinum drug which is used in the complex treatment of atherosclerosis. Specify the active compounds of dioscorea:

A. Steroid saponins
B. Alkaloids
C. Essential oil
D. Cardiac glycosides
E. Triterpene saponins

40. Preparations made out of eleutherococcus roots and rhizomes are administered as a tonic and adaptogenic drug. If these preparations cannot be found in a pharmacy, they can be substituted by the analogous preparations made of the following raw material:

A. Ginseng roots
B. Elecampane roots
C. Rhizomes and roots of valerian
D. Polemonium roots
E. Acorus calamus roots

41. On the base of licorice root different drug dosage forms are produced, notably tablets, powders, syrups, teas. The only unused form is injection solution. Licorice roots exhibit haemolytic properties typical for the following active substances

A. Saponins
B. Alkaloids
C. Essential oils
D. Iridoids
E. Polysaccharides

42. Standard raw herbal material of lily-of-the-valley is obtained by drying it at a temperature of 50–60^0 C in order to prevent the possibility of the following biochemical process:

A. Enzymatic hydrolysis of cardiac glycosides

86. Representatives of the family Solanaceae are widely used in medical practice as alkaloid-containing plants. Which representative is the source for production of semi-synthetic steroid hormones?

A. *Solanum laciniatum*
B. *Atropa belladonna*
C. *Datura stramonium*
D. *Hyoscyamus niger*
E. *Solanum tuberosum*

87. Select a reagent that should be applied by an analytical chemist in order to detect alkaloids in the herbal raw material:

A. Dragendorff reagent
B. Bromine water
C. Alkaline solution
D. Stahl's reagent
E. Trim-Hill reagent

88. Most alkaloids are isolated from the biological material by means of polar solvents. Which of the listed alkaloids is isolated by the way of distillation with water vapour?

A. Coniine
B. Strychnine
C. Cocaine
D. Atropine
E. Quinine

89. A laboratory received some herbal raw material for analysis. It is a composition of ovoid-pointed leaves up to 25 cm long and 20 cm wide; the leaf base is cuneate, the leaf edge is emarginate, The cutting is long and cylindric. The leaf venation is pinnatisect; the midrib and the first-order veins project significantly on the inferior surface of the leaf. The superior leaf surface is dark green, the inferior surface is light green. The plant has a weak narcotic smell. The taste cannot be determined. The plant is poisonous! The described herbal raw material relates to the following plant:

A. *Datura stramonium*
B. *Passiflora incarnata*
C. *Chelidonium majus*
D. *Vinca minor*
E. –

90. Most alkaloids are isolated from the biological material by polar solvents. Which of

B. Oxidation of phenolic compounds
C. Volatilization of essential oils
D. Oxidation of resins
E. Oxidation of terpenoids

43. Cumulating drugs - Digitoxin and Cordigitum - are used to treat chronic cardiac insufficiency. What plant is used as a raw material to produce them?
A. Digitalis purpurea
B. Strophanthus kombe
C. Adonis vernalis
D. Convallaria majalis
E. Erysimum canescens

44. Preparations containing cardiosteroids are produced out of the following raw herbal material:
A. Herba Convallariae
B. Cortex Quercus
C. Radix Taraxaci
D. Folia Ficusi Caricae
E. Folia Sennae

45. What drug from the group of cardiac glycosides can be used as an alternative for strophanthine if it is not available at a pharmacy?
A. Corglycon
B. Isolanidum
C. Digitoxin
D. Adonisidum
E. Celanidum

46. Woolly foxglove is used as raw material for the production of the following drug:
A. Lantosidum
B. Corglycon
C. Digitoxin
D. Adonizid
E. Erysimosidum

47. Lily of the valley is widely regarded as a cardiac stimulant and sedative. During the raw material procurement, the following plant may occur in the harvested crop
A. Round-leaved pyrola
B. Spring adonis
C. Treacle-mustard (*Erysimum cheiranthoides*)
D. Viola tricolor
E. Viola arvensis

the listed alkaloids is isolated by the way of distillation with water vapour?
A. Coniine
B. Strychnine
C. Cocaine
D. Atropine
E. Quinine

91. Analysis of an extract by chromatographic method revealed presence of phenyl prapanolamine. It is the metabolite of the following alkaloid:
A. Ephedrine
B. Pyrocatechin
C. Aconitine
D. Securinin
E. Reserpine

92. Leaves of belladonna, henbane and datura containing tropane alkaloids must be stored according to the following list requirements:
A. B list (these drug substances require caution in handling, storage or use)
B. A list (poisonous drug substances)
C. General sales list
D. Essential oil materials list
E. List of substances equivalent to narcotics

93. Codeine can be derived for medical purposes out of a plant alkaloid by means of semisynthetic method. Name this alkaloid:
A. Morphine
B. Papaverine
C. Berberine
D. Protopine
E. Chelidonine

94. Intoxication cases were observed during harvesting raw herbal material containing potent and toxic substances. What raw herbal material SHOULD NOT be harvested by underage and pregnant?
A. Celandine grass
B. Walnut leaves
C. Valerian rootstock
D. Buckthorn bark
E. Blueberries

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Examples of questions and test tasks in pharmaceutical botany

1. The test tasks presented in the A-format workbook have one correct answer, which the student must choose:

Preparations containing cardiosteroids are produced out of the following raw herbal material:

A. Herba Convallariae *
B. Cortex Quercus
C. Radix Taraxaci
D. Folia Ficusi Caricae
E. Folia Sennae

* - correct answer

2. The task of filling in the tables is performed by entering data into the table in response to the question posed to the table.

Example: Writing a list of the names of species of medicinal plants by eco-coenotic affinity to forest, meadow, ruderal, coastal aquatic and wetland communities.

Name of the species name of the raw materials	**Eco-coenotic affinity**
Polygonum aviculare	grasslands
Betula pendula	forest

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Workbook for independent work of students in resource science of medicinal plants (classroom and out of class). Study manual