

**Ministry of Health of Ukraine  
National Pirogov Memorial Medical University, Vinnytsya**

**Department of Pharmaceutical Chemistry**

«AGREED»

with the Methodical Council  
of the Pharmaceutical Faculty

Minutes № 2

Dated «21» 12 2023

Head of the Methodical Council  
of the Pharmaceutical Faculty



assoc. prof. of HEI Tetyana

YUSHCHENKO

«APPROVED»

by the Academic Council of Stomatological  
and Pharmaceutical Faculty

Minutes № 2

Dated «26» 12 2023

Head of the Academic Council of  
Stomatological and Pharmaceutical Faculty



prof. of HEI Serhiy POLISHUK

**Instruction to the Station  
Objective Structured Practical Examination (OSPE)**

Station name	<i>Station №6. Pharmacognostic Analysis of Medicinal Plant Raw Materials</i>
Subject	Pharmacognosy
Speciality	226 «Pharmacy, industrial pharmacy»
Educational qualification	Master of pharmacy
Professional qualification	Pharmacist
Course	V
Form of study	Full-time

**Instruction to the station № 6**  
**«Pharmacognostic Analysis of Medicinal Plant Raw Materials»**

**Tasks:**

1. Identify this raw material and indicate the English, Latin names of the plant, its family and raw material; specifics of harvesting, drying and storage; BAS groups the raw materials belong to; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with a similar pharmacological action.

**Station equipment:**

1. Scenario of a practical situation.
2. Medicinal plant raw materials.
3. Morphological characteristics of the studied MPRM.
4. A<sub>4</sub> paper.
5. Pen.

In case of **distance form of studying** (martial law, emergency situations or a state of emergency (special period) **the procedure for conducting an objective structured practical examination (OSPI)** is governed by the Regulation on the introduction of elements of distance learning in VNMU named after M. I. Pirogov and will take place on the **Microsoft Teams platform**.

Equipment for remote form of OSPI: practical situation, morphological characteristics of MPRM, samples of MPRM.

On the day of the exam, the secretary of the State Examination Commission connects the student of the group, which takes the exam to the meeting of the examiner, according to the schedule. At the station, the student must greet the examiner and introduce himself, present a document (passport) proving his identity to the teacher.

The student receives a practical situation, which is provided to test the ability of the student to determine the identity of the whole and powdered medicinal plant raw materials (MPRM) on macro- and microdiagnostic characteristics; to confirm the high quality of MPRM by qualitative and microchemical reactions to the main groups of biologically active substances contained in medicinal plants and raw materials (polysaccharides, fatty oils, flavonoids, coumarins, tannins, iridoids, essential oils, saponins, anthracene derivatives, cardiac glycosides vitamins, etc.); establish the terms and methods of harvesting, drying and storage of MPRM depending on the chemical composition and dynamics of accumulation of biologically active substances; recognize impurities of botanically related species; provide recommendations for the rational use of MPRM, biologically active substances of plant origin, phytopreparations and their substitutes with similar pharmacological action.

***Duration of work at the station: 8 minutes.*** After the end of time, the examiner does not accept the answer. Note that the teacher is an observer of your actions and does not provide any instructions or comments and doesn't question the students.

**Requirements for passing the station:**

- use a computer or laptop during the response.
- the answer is accepted under the condition that the camera and microphone are on, so that the student who passes the exam is clearly visible, and the sound is clear;
- the process of working at the station is recorded.

**It is forbidden** to use a mobile phone and other electronic gadgets, to transmit, copy and take out any information related to the exam.

The part of OSPI on pharmacognosy includes station №6 "Pharmacognostic analysis of medicinal plant raw materials"

Practical situations on pharmacognostic analysis and pharmacological characteristics of medicinal plant raw materials containing compounds of primary synthesis, phenolic compounds, terpenoids and alkaloids are presented.

**An example of assessing the response of a higher education applicant (HEA) to the practical situation of pharmacognosy**

*Practical situation.* The laboratory received MPRP with the following morphological features for analysis: rounded cordate leaves with incised margins that are irregularly, coarsely, and finely toothed; the upper leaf surface is naked. while its lower surface is covered in white down. Leaf petioles are thin, with a groove on the upper part, often downy. Leaf blade length is usually 8-15 cm, a petiole is approximately 5 cm long. The, upper leaf surface is green, while the lower leaf surface is whitish-gray. No odor. The taste is slightly bitter with a slimy texture.

**Tasks:**

1. Identify this raw material and indicate the English, Latin names of the plant, its family and raw material; specifics of harvesting, drying and storage; BAS groups the raw materials belong to; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with a similar pharmacological action.

**Example of answer and accrual of points:**

<b>Parameters that are evaluated</b>	<b>Student's response</b>	<b>Point</b>
<b>Identification of raw materials</b>		<b>0 / 0,25 / 0,5 / 1,0</b>
	Coltsfoot leaves	0,25
	Coltsfoot Family Asteraceae	0,5
	Folia Farfarae Coltsfoot (Tussilago farfara) Family Asteraceae	1,0
<b>Harvesting</b>		<b>0 / 0,25 / 0,5 / 1,0</b>

	Harvested after flowering	0,25
	Collection period: end of May - June. Dried by air-shadow method or in dryers	0,5
	Harvested in late May - June. Dried in a well-ventilated room or at a temperature of 50-60 °C. General list of storage, hygroscopic raw materials	1,0
<b>BAS group, chemical composition of raw materials, standardization methods</b>		<b>0 / 0,25 / 0,5 / 1,0</b>
	Polysaccharides	0,25
	Mucilage (up to 10%), carotenoids, vit. C, organic acids, essential oil, saponins, bitter glycoside tussilyagin, phenolic compounds, alkaloids	0,5
	Polysaccharides (mucilage up to 10%), carotenoids, vit. C, organic acids, essential oil, saponins, bitter glycoside tussilyagin, phenolic compounds, alkaloids. Histochemical reactions for determination mucilage. 1. The reaction with methylene blue. The mucilage cells become blue. 2. The reaction with alkali and copper sulfate. The mucilage cells become blue. 3. The reaction with ink. The white unstained mucilage cells are seen. Quantitative analysis. Polysaccharides content in MPRM are determined with a help of gravimetric method (precipitate polysaccharides with a help of alcohol).	1,0
<b>Application</b>		<b>0 / 0,25 / 0,5 / 1,0</b>
	Expectorant, anti-inflammatory, disinfectant action	0,25
	The leaves are part of the chest fee (№1, №2), diaphoretic tea, Bronchial Plus syrup for children. The infusion is used internally, and poultices are used externally as an emollient and anti-inflammatory agent.	0,5
	Infusion of leaves, fees and syrups are used in diseases of the airways (bronchitis, laryngitis, bronchiectasis, lung abscesses) as expectorants. Externally (poultices) - softening, disinfectant and anti-inflammatory agent	1,0
<b>Substitutes with a similar pharmacological action</b>		<b>0 / 0,5 / 1,0</b>
	Marshmallow roots, Iceland moss, Small-leaved	0,5

	lime flowers	
	Marshmallow roots (Mukaltin, Alteika syrups, Altemix Broncho, Bronchofit species, Pectoral species №1); Iceland moss (Pectolvan Phyto, Isla-Moos, Isla-Mint, Gerbion syrup of Icelandic moss); Small-leaved lime flowers (Malipin, Bronchophyte)	1,0
<b>Minimum / maximum points</b>		<b>0 / 5,0</b>

**List of situations:** analysis of MPRM containing different groups of BAS (polysaccharides, fats and fat-like substances, proteins and proteins, vitamins, macro- and microelements and organic acids, bitters, essential oils, resins and balms, saponins, cardiac glycosides, simple phenolic compounds, coumarins and chromones, lignans, xanthonenes, flavonoids, anthracene derivatives, tannins, alkaloids).

## LIST OF PRACTICAL SITUATIONS

### Practical situation №1

The laboratory received MPRM with the following morphological features for analysis: rounded cordate leaves with incised margins that are irregularly, coarsely, and finely toothed; the upper leaf surface is naked. while its lower surface is covered in white down. Leaf petioles are thin, with a groove on the upper part, often downy. Leaf blade length is usually 8-15 cm, a petiole is approximately 5 cm long. The upper leaf surface is green, while the lower leaf surface is whitish-gray. No odor. The taste is slightly bitter with a slimy texture.

**Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### Practical situation №2

The laboratory received MPRM with the following morphological features for analysis: fine flat glossy egg-shaped seeds (one is smooth, vary in colour from pale yellow to brown, has pale yellow raphe. No smell is detected. The taste is slimy and oily and bitter.

**Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.

2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №3**

The laboratory received MPRM with the following morphological features for analysis: rounded, wrinkled fruits of orange-red colour and sour-sweet slightly astringent taste, up to 3 cm in length, up to 1.5 cm in diameter. Inside the fruits there were many nutlets which were small, hard, angled, yellow coloured. Nutlets and the inner surface of fruit were thickly covered by long very hard bristly hairs.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №4**

The laboratory received MPRM with the following morphological features for analysis: leaves simple, petiolate, thin, brittle, up to 20 cm long, up to 9 cm wide, ovate-lanceolate or broadly ovate, rough-haired, with a pointed apex, heart-shaped at the base, sharply and coarsely serrated at the edges. The color is dark green. The smell is peculiar. The taste is bitter.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №5**

The laboratory received MPRM with the following morphological features for analysis: whole inflorescences which have the form of anthodium with diameter till 5 cm, marginal and middle flowers, with bright yellow-orange colour, faintly aromatic odour, salty-bitter taste.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №6**

The laboratory received MPRM with the following morphological features for analysis: fruits - ovoid achenes, slightly compressed on the sides, 5-8 mm long, 2-4 mm wide. The top is obliquely cut with the protruding remnant of the column, with a roller around it or without the rest of the column. The base of the achene is blunt, the scar is slit-like or rounded. The surface is smooth, shiny, sometimes matte, longitudinally wrinkled. The fruits are spotted, from black to light brown, sometimes with a purple tinge. Odorless. The taste is slightly bitter.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №7**

The laboratory received MPRM with the following morphological features for analysis: umbrella-shaped yellowish-green inflorescences, which consist of 3-11 flowers on peduncles, sitting on a common peduncle. The main axis of the inflorescence fused with the central vein of the bract. The flowers are five-membered, the bracts are membranous, oblong-elliptical, up to 6 cm long and 1.5-2 cm wide. The color of the flowers is whitish-yellow. The smell is weak, fragrant. The taste is sweet, slightly tart, with a feeling of sliminess.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №8**

The laboratory received MPRM with the following morphological features for analysis: flower baskets are small, spherical, 4-6 mm in diameter, single or several together on short woolly-felt peduncles. The leaves of the wrapper are membranous, obtuse, lemon-yellow, dry, shiny. Pedicel glabrous, all flowers tubular, with a fly, lemon-yellow or orange, 5-toothed, bisexual. The smell is weak, fragrant. The taste is spicy-bitter.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.

2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №9**

The laboratory received MPRM with the following morphological features for analysis: fruits - apple-shaped stones, spherical or broadly ellipsoidal, hard, reticulate-wrinkled, 6-14 mm long, 5-11 mm wide, with a 5-toothed fringe on top (remnants of sepals); in the flesh of the fruit are 1-5 light yellow woody stones of irregular triangular shape; their surface is pitted-wrinkled or furrowed. Color yellow-orange, brownish-red to dark brown or black, sometimes with a white tinge of crystallized sugar. Odorless. The taste is sweet.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №10**

The laboratory received MPRM with the following morphological features for analysis: tubular or grooved pieces of bark up to 2 mm thick, of different lengths (10-25 cm). The outer surface is matte, smooth, dark brown or grayish-brown with whitish lentils or gray spots. When the cork layer is lightly scraped off, a red layer appears. The inner surface is smooth, yellowish-orange. Fracture light yellow, fine-bristled. The smell is weak. The taste is bitter. When chewing the bark, saliva turns yellow.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №11**

The laboratory received MPRM with the following morphological features for analysis: flowering upper shoots with stems non exceeding 4 mm in diameter. Leaf fragments are pubescent on both sides and therefore silky-gray. The small, yellow and spherical flower-heads are recognizable. The stem fragments are angular and silvery gray on surface with pith inside. Odour is aromatic and characteristic. Taste is strongly bitter and aromatic.

#### **Tasks:**



1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №12**

The laboratory received MPRM with the following morphological features for analysis: rhizomes and roots are ovoid-cylindrical, light grayish-brown rhizome bears many long, almost cylindrical roots; they are light to medium grayish-brown, 1-mm thick, several cm long and partly covered with coarse longitudinal wrinkles. Odour is characteristic, reminiscent of isovaleric acid. Taste is mildly sweet and spicy, somewhat bitter.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №13**

The laboratory received MPRM with the following morphological features for analysis: conical flower heads, each bearing a few white ligulate florets and numerous yellowish orange to pale yellow tubular or disk florets on conical, narrow hollow receptacles with a short peduncle; disk florets are perfect and without a pappus; ray florets are pistillate, white, 3-toothed and 4-veined; involucre is hemispherical composed of 20-30 imbricate, oblanceolate and pubescent scales; peduncles are weak brown to dusky greenish yellow, longitudinally furrowed, more or less twisted and up to 2.5 cm long. The odour is pleasant, aromatic; the taste is aromatic and slightly bitter.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №14**

The laboratory received MPRM with the following morphological features for analysis: pieces of roots and underground shoots of cylindrical shape of different lengths, up to 1 m long and 5-20 mm in diameter; externally, the bark is brownish

grey to dark brown, longitudinally wrinkled, occasionally bearing small dark buds in rhizomes or small circular or transverse rootlet-scars in roots. The peeled root is yellow, smooth, fibrous, finely striated; fracture, fibrous, in the bark and splintery in the wood; internally, bright yellow. A distinct cambium ring separates the yellowish grey bark from the finely radiate yellow wood. The fracture of roots is fibrous, yellow in colour. The odour is absent, the taste is sickly-sweet.

**Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

**Practical situation №15**

The laboratory received MPRM with the following morphological features for analysis: leaves, about 8 cm long and up to 3 cm wide, with petioles of varying length and broadly ovate, rounded or almost cordate lamina at the base. The thin leaves have a dark green upper surface, which is slightly pubescent and a lighter green lower surface that is glabrous or only slightly pubescent along the veins with a small, glandular punctuation. The margin is irregularly crenate or serrate, and the venation prominent on lower surface. The odour is aromatic, reminiscent of lemon, the taste is pleasantly spicy.

**Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

**Practical situation №16**

The laboratory received MPRM with the following morphological features for analysis: fruits up to 16 cm long and 4 cm wide, conical, sometimes slightly curved, usually with the remnant of a five-toothed calyx and a short peduncle of brownish-green color. The walls of the fruit are thin, brittle, smooth and shiny on the outside, dark red. The taste is very burning, the smell is not determined (!).

**Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №17**

The laboratory received MPRM with the following morphological features for analysis: leaves with long sheaths, separate or conjugate, oval or oblong-elliptical in shape; acuminate, entire, glabrous on both sides, with arching venation, green, petioles often yellowish. The leaf is 10-20 cm long, 3-8 cm wide. Flower scapes are naked, light green triangular or half rounded in cross-section, terminating in a unilateral loose raceme. Flowers with a simple perianth are on bent flower stems, emerging from the axils of short, filmy, lanceolate bracts. The corollalike perianth is bell-shaped, 6 stamens on short filaments fixed at base of the perianth. The odour is weak, faint. Taste is not determined!

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №18**

The laboratory received MPRM with the following morphological features for analysis: leaves have a slightly wavy margin, and sometimes with a notched tip. The upper surface of the leaves is dark-green and shiny, the lower surface is mat green, with visible brownish spots (glandules). Odorless. The taste is bitter, astringent.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №19**

The laboratory received MPRM with the following morphological features for analysis: pieces of leaves of various shapes up to 10 mm or more with admixtures of flowers and buds. The edge of the leaf is sharply serrated, the leaves are bare, only below the veins visible liquid pressed hairs and golden-yellow glands throughout the plate. The color of the leaves is from light green to dark green. The smell is strong, pleasant, the taste is slightly burning, cooling.

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.

2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.

### **Practical situation №20**

The laboratory received MPRM with the following morphological features for analysis: leaves are lanceolate-falcate, bifacial, 8-30 cm long, 2-7 cm wide; the petiole is twisted, strongly wrinkled, 2-3 cm, occasionally 5 cm, in length; apex, when present, is acute or acuminate; base is unequal, obtuse or somewhat rounded, margin is uneven, revolute; ventral and dorsal surfaces are grayish-green to pale yellowish-green, coriaceous, glaucous, glabrous, glandular-punctate, with numerous small, rounded, brown dots of cork; venation is pinnate-reticulate, veins of the first order are running to a short distance from margin where they are anastomosed and form a vein nearly parallel with the margin. In the transmitted light, small essential oil reservoirs are visible. The smell is fragrant, specific (cineole).

#### **Tasks:**

1. Identify this raw material and indicate the English, Latin names of plant, family, raw material; features of harvesting, drying and storage; BAS groups to which raw materials belong; chemical composition of raw materials; methods of standardization of MPRM.
2. Provide recommendations for the rational use of this MPRM, phytopreparations made on the basis of its BAS; suggest substitutes with similar pharmacological action.