

**MINISTRY OF HEALTH OF UKRAINE  
BOGOMOLETS NATIONAL MEDICAL UNIVERSITY**



**Sample test questions with explanations for preparation for  
the licensed exam KROK-2 (PHARMACOGNOSY)**

a manual for students of higher pharmaceutical educational institutions

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**Reviewer:**

*Minarchenko V. M.* – doctor of biological science, professor, head of pharmacognosy and botany department Bogomolets National Medical University

*Polova Zh. M.* – PhD of pharmaceutical science, assistant professor, acting head of pharmacy and industrial technology department Bogomolets National Medical University

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**Compilers:**

*Karpiuk U.V.* - doctor of pharmaceutical science, professor of pharmacognosy and botany department

*Pidchenko V.T.* - PhD of pharmaceutical science, associate professor of pharmacognosy and botany department

*Cholak I.S.* - PhD of pharmaceutical science, associate professor of pharmacognosy and botany department

*Butko A.U.* - PhD of pharmaceutical science, associate professor of pharmacognosy and botany department

*Kovalska N.P.* - PhD of pharmaceutical science associate professor of pharmacognosy and botany department

*Makhynya L.M.* - PhD of biological science, associate professor of pharmacognosy and botany department

*Dvirna T.S.* - PhD of biological science, assistant of pharmacognosy and botany department

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## Topic: General pharmacognosy. Harvesting and storing of MPM

1.	<p>Intoxication cases were observed during harvesting <b>raw herbal material containing potent and toxic substances</b>. What raw herbal material <b>SHOULD NOT be harvested by underage and pregnant?</b></p> <p>A. <i>Celandine grass</i>          B. <i>Walnut leaves</i>          C. <i>Valerian rootstock</i>          D. <i>Buckthorn bark</i>          E. <i>Blueberries</i></p>	<p><i>Celandine grass</i> contains poisonous substances – alkaloids. Poisonous substances can cause allergic reactions, dermatitis, inflammation of the mucous membranes of the eyes, nose, throat, etc.</p>
2.	<p>Thymol is the main component of <i>Thymus serpyllum</i> essential oil. <b>What is the time of harvesting</b> for this raw herbal material?</p> <p>A. <b>Peak florescence period</b>          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</p>	<p>The largest amount of active substances (essential oils) is concentrated in MPM in this period of vegetation.</p>
3.	<p><b>Sage leaves</b> procured for the production of <b>essential oil should be dried at a temperature of:</b></p> <p>A. 25-30 °C          B. 50-60 °C          C. 100 °C          D. 60-70 °C          E. 70-80 °C</p>	<p>Sage leaves (<i>Salvia officinalis</i>) contain essential oil as the main group of biological active compounds. The parts of the plant which contain essential oils are dried slowly, spreading with a thick layer, at a temperature of 25-30 °C. The higher temperature will lead to the loss of essential oil.</p>
4.	<p><b>Leaves of greater plantain</b> are harvested in summer by mowing or cutting them with a knife or a sickle. There is always one developed plant left per 1 m<sup>2</sup>. The plant is harvested <b>in the following vegetation period:</b></p> <p>A. <b>Blooming</b>          B. Budding          C. Rosetting</p>	<p>The largest amount of active substances (polysaccharides) is concentrated in MPM in this period of vegetation</p>

	D. Beginning of fruiting E. Ripeness	
5.	A certain type of <b>herbal raw material is being collected in spring during sap flow.</b> Specify this material: <b>A. Bark</b> B. Flowers C. Buds D. Infructescences E. Roots	The largest amount of active substances (essential oils) are concentrated in MPM in this period of vegetation and a bark it is well separated from the wood

### Topic: Carbohydrates. Polysaccharides

1.	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. <b>A. Flax seeds</b> B. Pumpkin seeds C. Plantago psyllium D. Strophanthus seeds E. Peanut seeds	This morphological description is characteristic for flax seeds 
2.	<b>Plantaglucide is used to treat peptic ulcer disease of stomach and duodenum with normal acidity and hypoacidity.</b> This drug is obtained from the following <b>plant</b> : <b>A. <i>Plantago major</i></b> B. <i>Plantago psyllium</i> C. <i>Plantago media</i> D. <i>Plantago stepposa</i> E. <i>Plantago lanceolata</i>	Plantaglucide is produced from <i>Plantago major</i> leaves. Plantain leaves contain a polysaccharide complex of mucus and pectin, which cause enveloping, softening, anti-inflammatory effects, and also have the ability to adsorb bacteria
3.	<b>Plantain leaves</b> are used for production of <b>Plantaglucidum</b> , which has <b>antiulcerogenic</b>	

	<p><b>action.</b> The plant material analysis involves quantitative determination of the following <b>class of compounds:</b></p> <p><b>A. Polysaccharides</b>  B. Vitamins  C. Amarinines  D. Terpenes  E. Carotenoids</p>	
4.	<p><b>Leaves of greater plantain are harvested</b> in summer by mowing or cutting them with a knife or a sickle. There is always one developed plant left per 1 m<sup>2</sup>. The plant is harvested <b>in the following vegetation period:</b></p> <p><b>A. Blooming</b>  B. Budding  C. Rosetting  D. Beginning of fruiting  E. Ripeness</p>	<p>According to the general rules for collecting raw materials, the leaves are harvested before or during the flowering period. The exception is plants whose growing season begins with the flowering without the formation of leaves.</p>
5.	<p>The possible <b>admixture</b> in the crop of raw <b>coltsfoot leaves (<i>Tussilago farfara</i>)</b> is the leaf of:</p> <p><b>A. Cotton burdock (<i>Arctium tomentosum</i>)</b>  B. Common plantain  C. Nettle  D. Marshmallow (<i>Althaea officinalis</i>)  E. <i>Primula officinalis</i></p>	<p>The leaves of <i>Arctium tomentosum</i> are morphologically close to the leaves of coltsfoot (<i>Tussilago farfara</i>).</p>  <p><i>Tussilago farfara</i> <i>Arctium tomentosum</i></p>
6.	<p><b>Coltsfoot</b> preparations are used for upper airways treatment. During procurement of this herbal raw material the following <b>admixture</b> may appear:</p> <p><b>A. Great bur (<i>Arctium lappa</i>)</b>  B. Common plantain (<i>Plantago major</i>)  C. Spring adonis (<i>Adonis vernalis</i>)  D. Marsh mallow (<i>Althaea officinalis</i>)  E. Pot marjoram (<i>Origanum vulgare</i>)</p>	<p><i>Arctium tomentosum</i> is the adulterant (morphologically close) to the leaves of coltsfoot (<i>Tussilago farfara</i>). Greater burdock (Great bur) - <i>Arctium lappa</i> - is a one of the representatives of <i>Arctium</i> genus and can be an adulterant to coltsfoot leaves.</p>
7.	<p>A pharmacy depot received a batch of <b>common plantain leaves. According to the</b></p>	<p>Common plantain leaves (<i>Plantago major</i>) are standardized on the</p>


	<p>requirements of the <b>Pharmacopoeia</b>, this herbal raw material is of adequate quality if it <b>contains the following active substances</b>:</p> <p><b>A. Polysaccharides</b>  B. Flavonoids  C. Tannins  D. Anthracene derivatives  E. Essential oils</p>	<p>content of polysaccharides (according to SPhU)</p>
8.	<p><b>Upper airways diseases</b> can be <b>treated</b> by means of herbal raw materials containing <b>mucilages</b>. The <b>plant source</b> of this compound class is:</p> <p><b>A. <i>Radix Althaeae</i></b>  B. <i>Radix Inulae</i>  C. <i>Radix Ipecacuanhae</i>  D. <i>Radix Rhodiolae</i>  E. <i>Radix Belladonnae</i></p>	<p><i>Radix Althaeae</i> contains mucilage and has expectorant, enveloping and anti-inflammatory effect</p>
9.	<p>During microscopy of <b>althaea root</b> it is necessary to determine <b>the presence of starch granules</b> within the plant cells. What <b>reagent</b> enables such analysis?</p> <p><b>A. Lugol's solution</b>  B. Ammonium hydroxide  C. Concentrated sulfuric acid  D. Alcohol solution of <math>\alpha</math>-naphthol  E. Thymol solution</p>	<p>Lugol's solution is a typical reagent for the determination of starch</p>
10.	<p>A storehouse received a batch of <b>althaea roots</b>. For its verification a <b>drop of ammonia solution</b> was applied upon the <b>root section</b>; the spot of section turned <b>yellow</b>. This is the evidence of presence of the following substance:</p> <p><b>A. Mucilages</b>  B. Tannins  C. Gum  D. Pectins  E. Vitamin C</p>	<p>The above reaction is typical for the determination of mucilage</p>

## Topic: Lipids and Lipoids

1.	<p><b>Fatty oils</b> containing unsaturated fatty acids are <b>used for the prophylaxis of atherosclerosis</b>. Specify the starting materials of herbal origin that contain fatty oil:</p> <p><b>A. Pumpkin seed</b>          B. Ispaghula seed          C. Chestnut seed          D. Parsnip fruits          E. Psoralea fruits</p>	<p>Fatty oil contains polyunsaturated fatty acids, phospholipids, vitamins A and E. This complex of substances is used for the treatment and prevention of atherosclerosis.</p>
2.	<p><b>Fatty oil</b> containing saturated (mistake! should be “unsaturated”) fatty acids <b>is used for atherosclerosis prevention</b>. Specify the medicinal plant that is used for oil production:</p> <p><b>A. Flax seeds</b>          B. Fennelflower seeds          C. Dill seeds          D. Black chokeberry fruits          E. Hawthorn fruits</p>	
3.	<p><b>Fatty oil</b> containing unsaturated fatty acids <b>is used for atherosclerosis prevention</b>. What herbal raw material contains such fatty oil?</p> <p><b>A. Cucurbit seeds</b>          B. Buckhorn plantain (<i>Plantago lanceolata</i>) seeds          C. Chestnut (<i>Castanea</i>) seeds          D. Parsnip fruitages          E. Scurfy pea (<i>Psoralea</i>) fruitages</p>	
4.	<p>What <b>fatty oil is nondrying due to its oleic acid glyceride content?</b></p> <p><b>A. Ricini oleum</b>          B. <i>Helianthi oleum</i>          C. <i>Maydis oleum</i>          D. <i>Cucurbitae oleum</i>          E. <i>Lini oleum</i></p>	<p>Fatty oils are classified according to the composition of unsaturated acids into non-drying (glycerides of oleic acid), semi-drying (glycerides of linoleic acid) and drying (glycerides of linolenic acid). Castor oil contains mainly glycerides of oleic acid and belongs to non-drying oils.</p>



## Topic: Vitamins. Macro- and microelements

1.	<p><b>Stinging nettle (<i>Urtica dioica</i>) leaves</b> are mostly used as a <b>hemostatic</b> in tinctures and liquid extract to treat lung, intestinal, and uterine hemorrhages. <b>What bioactive substance provides hemostatic effect?</b></p> <p><b>A. Vitamin K</b>          B. Beta-carotene          C. Rutin          D. Reserpine          E. Digitoxin</p>	<p><i>Urtica dioica</i> accumulates vitamin K, C, carotenoids and it is used as multivitamin and hemostatic MP.</p>
2.	<p>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?</p> <p><b>A. <i>Hippophae rhamnoides</i></b>          B. <i>Ammi majus</i>          C. <i>Aronia melanocarpa</i>          D. <i>Vaccinium myrtillus</i>          E. <i>Coriandrum sativum</i></p>	<p>The given morphological description is typical for the fruits of <i>Hippophae rhamnoides</i></p> 
3.	<p>Pharmaceutical warehouse received a batch of herbal raw material of <b>cinnamon rose</b>. <b>Under the State Pharmacopoeia, it is required to test this raw material for the following active substances:</b></p> <p><b>A. Ascorbic acid</b>          B. Flavonoids          C. Tannins          D. Anthracene derivatives          E. Essential oil</p>	<p>The fruits of cinnamon rose (dog rose) are standardized on the content of ascorbic acid (according to SPhU)</p>
4.	<p>The <b>cholagogue</b> derived from <b>Rosa canina</b> fruit is used in treatment of liver and gallbladder diseases. Name this <b>drug</b>:</p> <p><b>A. Cholosas</b></p>	<p>From the list below, Holosas is obtained from the fruits of Rosa canina. It contains flavonoids and has a choloretic effect.</p>


	B. Phytolyt C. Chophytol D. Altan E. Allochol	
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### Topic: Proteins

1.	<b>Snake venom-based drugs</b> are widely applied in treatment of locomotor apparatus diseases. <b>Main components</b> of these vemons are: <b>A. Toxic proteins</b> B. Glucosinolates C. Alkaloids D. Phenol-alcohols E. Cardiac glycosides	Proteins are present in snake venom. They stipulate therapeutic and toxic action of snake venom.
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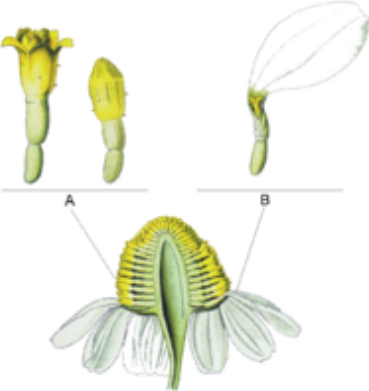

### Topic: Iridoids


1.	<b>Yellow gentian</b> contains <b>bitter glycosides</b> . Raw material of this plant is recommended for production of drugs with the following <b>effect</b> : <b>A. Stimulates appetite</b> B. Tonic C. Diuretic D. Hepatoprotective E. Venotonic	Bitter glycosides irritate the taste receptors, reflexively stimulate parasympathetic fibers that innervate the stomach and salivary glands. As a result, appetite and digestion are stimulated
2.	A pharmacy has no <b>quinquelobate motherwort</b> in stock. <b>It can be substituted</b> by the following herbal material: <b>A. Rhizomes and roots of valerian</b> B. Linden flowers C. Beggarticks grass D. Raspberry fruits E. Hypericum grass	Quinquelobate motherwort is used as a sedative remedy and can be substituted by rhizomes and roots of valerian. Only valerian rhizomes and roots has sedative action from the list of given MPM.
3.	<b>Valerian roots and rhizomes</b> are processed in the phytochemistry workshop to produce	Iridoids than are isolated from the plants of the Valerian family contain 5

	<p>tinctures and thick extracts that are the components of combined <b>sedatives</b>. Name the <b>group of bioactive compounds</b> that includes valerian <b>valpotriates - valtrate, acevaltrate, and dihydrovaltrate</b>:</p> <p><b>A. Iridoids</b>  B. Essential oils  C. Alkaloids  D. Polysaccharides  E. Saponins</p>	<p>or 6 hydroxyl groups in the iridoid skeleton, two of which form an epoxide, while others are esterified. As a result, the compounds were called "valpotriates" (valerian - epoxy - triesters). The valpotriates are divided into two groups depending on the degree of saturation of the bond in the C5: valtrates and dihydrovaltrates.</p>
4.	<p>A pharmaceutical warehouse received an herbal raw material that consists of "cones" with loose scales that are attached to a firm twig with or without fruits. Its collective fruits are pale green, fragrant, and bitter. Name the plant from which this herbal raw material was harvested:</p> <p><b>A. <i>Humulus lupulus</i></b>  B. <i>Alnus incana</i>  C. <i>Juniperus communis</i>  D. <i>Rubus idaeus</i>  E. <i>Olea europea</i></p>	<p>The given morphological description is typical for the <i>Strobuli Lupuli</i></p> 
5.	<p>According to the <b>State Pharmacopoeia of Ukraine</b>, the <b>herbal raw material used in production of plantaglucide</b> should be tested by means of <b>thin-layer chromatography</b>. The resulting chromatogram will <b>have a weak blue zone</b>, which will indicate the presence of:</p> <p><b>A. Aucubin</b>  B. Acorone  C. Acteoside  D. Azulene  E. Atropine</p>	<p>Aucubin belongs to a group of iridoids. Spots of iridoid glycosides are detected in UV-light or by using reagents (Stahl reagent and Trim Hill reagent). Iridoids form a blue zone.</p>


## Topic: Volatile oils

1.	<p>An <b>essential oil</b> is a component of such compound drugs as: <b>Inhalypt, Corvalol, Pinosol, Corvaldin, tooth drops</b>. What <b>raw herbal material</b> is a source of this essential oil?</p> <p><b>A. <i>Folia Menthae piperitae</i></b>          B. <i>Folia Betulae</i>          C. <i>Folia Urticae</i>          D. <i>Folia Agavae</i>          E. <i>Folia Absinthii</i></p>	<p>Given drugs Inhalypt, Corvalol, Pinosol, Corvaldin, tooth drops are belong to complex remedies.</p> <p>One of the ingredients which is contained in all of these preparations is the essential oil of peppermint leaves</p>
2.	<p><b>Menthol</b> has anesthetic and antiseptic effect. <b>What plant is the source</b> of menthol?</p> <p><b>A. <i>Folia Menthae piperitae</i></b>          B. <i>Folia Uvae ursi</i>          C. <i>Folia Eucalypti</i>          D. <i>Folia Salviae</i>          E. <i>Folia Absinthii</i></p>	<p>The peppermint leaves –<i>Menthae piperitae folia</i> – is used to obtaine an essential oil. The main component of peppermint essential oil is menthol.</p>
3.	<p><b>Sage leaves</b> procured for the production of <b>essential oil</b> should be <b>dried at a temperature</b> of:</p> <p><b>A. 25-30 °C</b>          B. 50-60 °C          C. 100 °C          D. 60-70 °C          E. 70-80 °C</p>	<p>The parts of the plant which contain essential oils are dried slowly, spreading with a thick layer, at a temperature of 25-30 °C.</p>
4.	<p><b>1,8-cineole</b> is <b>bactericidal component of essential oil</b>. Specify the <b>medicinal herb</b> that is <b>grown in Ukraine</b> and contains 1,8-cineole in its essential oil:</p> <p><b>A. <i>Salvia officinalis</i></b>          B. <i>Inula helenium</i>          C. <i>Origanum vulgare</i>          D. <i>Juniperus communis</i>          E. <i>Eucalyptus globulus</i></p>	<p>1,8-cineole is the main component of MPM of <i>Salvia officinalis</i> and <i>Eucalyptus globulus</i>. But among the given MPM only <i>Salvia officinalis</i> is cultivative in Ukraine</p>

5.	<p><b>Essential oil</b> of certain plant contains up to <b>80% of cineole</b>. Specify the <b>herbal raw material</b> that is collected from this plant:</p> <p><b>A. <i>Folia Eucalypti</i></b>          B. <i>Folia Betulae</i>          C. <i>Folia Melissa</i>          D. <i>Folia Menthae piperitae</i>          E. <i>Folia Absinthii</i></p>	<p><i>Eucalypti folia</i> has cineol as the main component of its essential oil and is standardized by the content of cineole (according to SPhU)</p>
6.	<p><b>Common juniper</b> is applied as a diuretic, anti-inflammatory and cholagogic agent. This plant gives the following <b>medicinal raw material</b>:</p> <p><b>A. Fruits</b>          B. Sprouts          C. Leaves          D. Roots          E. Seeds</p>	<p>The MPM of Common juniper – <i>Juniperus communis</i> is fruits (according to SPhU)</p>
7.	<p>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, involucre are yellow-green. The smell is specific, aromatic. The taste is bitter-spicy. What raw herbal material is it?</p> <p><b>A. <i>Flores Chamomillae</i></b>          B. <i>Flores Arnicae</i>          C. <i>Flores Calendulae</i>          D. <i>Flores Helichrysi arenarii</i>          E. <i>Flores Millefolii</i></p>	<p>The given morphological description is typical for the <i>Chamomillae flores</i></p> 
8.	<p>A teenager with hyporexia has been recommended to drink medicinal herbal tea of the following composition: <i>Herba Absinthii</i>, <i>Herba Millefolii</i>. Specify the <b>characteristic microscopic features of <i>Artemisia absinthium</i></b>, which indicate its presence in the herb mixture:</p> <p><b>A. T-shaped hairs along the leaf edge</b>          B. Simple and capitate hairs</p>	<p>T-shaped hairs along the leaf edge distinguish wormwood from other representatives of <i>Asteraceae</i> family.</p> 

	<p>C. Branched, simple and ciliated hairs  D. Retor-shaped hairs  E. Branched and capitate hairs</p>	
9.	<p>After harvesting the <b>calamus rhizomes</b> the received material should be dried. <b>What temperature range is required for obtaining good-quality raw material?</b>  A. 35-40 °C  B. 40-60 °C  C. 60-70 °C  D. 70-80 °C  E. 80-90 °C</p>	<p>The parts of the plant which contain essential oils are dried slowly, spreading with a thick layer, at a temperature not higher than 45 °C. Essential oil is able to evaporate at the temperatures above 45 °C.</p>
10.	<p><b>Calamus rhizome</b> 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 <b>admixture</b>:  A. <b>Iris rhizome</b>  B. Valerian rhizome  C. Elecampane roots  D. Althaea roots  E. Phlojodicarpus roots</p>	<p>Yellow iris (<i>Iris pseudacorus</i>) is morphologically close to calamus (<i>Acorus calamus</i>)</p>  <p><i>Acorus calamus</i> <i>Iris pseudacorus</i></p>
11.	<p><b>Birch buds</b> are user as a diuretic. <b>Quality</b> of the herbal raw materials <b>is determined by its content of</b>:  A. <b>Essential oil</b>  B. Lipids  C. Vitamins  D. Saponins  E. Iridoids</p>	<p>The quality of birch buds (<i>Betulae gemmae</i>) is determined by its content of essential oil (according to SPhU)</p>
12.	<p><b>Yarrow grass</b> is a component of herbal gastrointestinal remedies and is used to make herbal drugs. <b>According to the State Pharmacopoeia of Ukraine the quality of this herbal raw material is assessed by its content of</b>:  A. <b>Essential oils and proazulenes</b>  B. Alkaloids</p>	<p>The quality of yarrow grass (<i>Achillea millefolium</i>) is made by the content of essential oil and it's main components – proazulenes (according to SPhU)</p>

	<p>C. Polysaccharides D. Cardiacglycosides E. Vitamines</p>	
13.	<p><b>Thyme grass</b> is used for production of herbal medical products for treatment of respiratory tract infections. Under the <b>State Pharmacopoeis of Ukraine</b>, the raw herbal material is subject to chromatographic identification by means of <b>thin-layer chromatography</b>. <b>What substances are detected on the chromatographic plate</b> after its treatment with due reagent?</p> <p><b>A. Thymol and carvacrol</b> B. Atropine and hyoscyamine C. Quercetin and rutin D. Apigenin and luteolin E. Arbutin and methyl arbutin</p>	<p>The quality of thyme grass (<i>Thymus vulgaris</i>) is made by the content of the main components of its essential oils - thymol and carvacrol (according to SPhU)</p>
14.	<p>A pharmacy procured <b>common origanum</b>. What <b>drying conditions</b> should be applied for producing high quality crude drug?</p> <p><b>A. 35 – 40 °C</b> B. 80 – 90 °C C. 60 – 70 °C D. 50 – 60 °C E. 70 – 80 °C</p>	<p>Common origanum herb (<i>Origanum vulgare</i>) contains essential oil as the main group of biological active compounds. The parts of the plant which contain essential oils are dried slowly, spreading with a thick layer, at a temperature of 25-30 °C. The higher temperature will lead to the loss of essential oil.</p>
15.	<p><b>Flower buds of clove</b> contain the essential oil used for production of herbal antiseptics. <b>Under the State Pharmacopoeia of Ukraine</b>, the raw materials are <b>identified by the method of thin layer chromatography</b>. <b>What zones</b> can be identified on the chromatographic plate after their treatment with reagent?</p> <p><b>A. Eugenol and caryophyllene</b> B. Quercetin and rutin C. Hyoscyamine and scopolamine D. Apigenin and luteolin E. Scopoletin and umbeliferon</p>	<p>The quality of flower buds of clove (<i>Caryophylli flores</i>) is made by the content of the main components of its essential oils - eugenol and caryophyllene (according to SPhU)</p>

<p>16.</p>	<p>A biennial or perennial <b>plant</b> from the <b>Apiaceae</b> 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 "<b>dill water</b>". What plant is it?</p> <p><b>A. <i>Foeniculum vulgare</i></b>  B. <i>Carum carvi</i>  C. <i>Petroselinum crispum</i>  D. <i>Coriandrum sativum</i>  E. <i>Conium maculatum</i></p>	<p>The given morphological description is typical for the <i>Foeniculum vulgare</i> "Dill water" is produced on the basis of essential oils of fennel (<i>Foeniculi vulgare fructus</i>).</p> 
<p>17.</p>	<p>Complex drug product <b>Urolesan</b> is a litholytic, antispasmodic and diuretic agent. It contains extract of:</p> <p><b>A. <i>Origanum vulgare</i></b>  B. <i>Matricaria chamomilla</i>  C. <i>Rhododendron tomentosum</i>  D. <i>Thymus serpyllum</i>  E. –</p>	<p>Urolesan is a complex drug. It consists of: oleum <i>Abies</i>, oleum <i>Menthe piperitae</i>, extractum fructuum <i>Dauci sativi</i> fluidum, extractum fructuum <i>Strobili lupuli</i> fluidum, extractum herbae <i>Origani</i> fluidum</p>
<p>18.</p>	<p>One of the ways to derive essential oil is enfleurage, or maceration. <b>Essential oil can be derived by enfleurage from the following herbal raw material:</b></p> <p><b>A. Petals of Damascus rose</b>  B. Lemon skin  C. Coriander fruits  D. Mint leaves  E. Camomile flowers</p>	<p>In petals of of Damascus rose essential oil is localized in the glandular spots. That's why the best method of obtaining of essential oils for this MPM is enfleurage. Enfleurage is a method, which is based on the extraction of essential oils from flowers of medicinal plants with a mixture of melted animal fat.</p>

### Topic: Triterpenoids. Steroids. Saponins


<p>1.</p>	<p>A dispensing chemist can recommend a drug made from seeds of <i>Aesculus hippocastanum</i> to be taken as a <b>veintonic and antithrombotic</b> agent to treat venous congestion and veins dilatation of lower extremities. This <b>drug</b> is:</p>	<p>Aescusan is a drug from the liquid extract of <i>Aesculus hippocastanum</i> seeds</p>
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	<p>A. Aescusan  B. Phytolysin  C. Flamin  D. Marelin  E. Ajmaline</p>	
2.	<p>Drug plant <i>Dioscorea nipponica</i> is the starting material for the production of <b>Polysponinum</b> - the drug, which is used in the complex <b>treatment of atherosclerosis</b>. Specify the <b>active compounds of dioscorea</b>:</p> <p>A. <b>Steroid saponins</b>  B. Alkaloids  C. Essential oil  D. Cardiac glycosides  E. Triterpene saponins</p>	<p><i>Dioscorea nipponica</i> contains steroid saponins. They react with cholesterol and form complex insoluble in water. That's why Polysponinum is a drug from <i>Dioscorea nipponica</i>, which is used in the complex treatment of atherosclerosis.</p>
3.	<p>Preparations made out of <b>eleutherococcus roots and rhizomes</b> are administered as a <b>tonic and adaptogenic</b> drug. If these preparations cannot be found in a pharmacy, they <b>can be substituted by</b> the analogous preparations made of the following raw material:</p> <p>A. <b>Ginseng roots</b>  B. Elecampane roots  C. Rhizomes and roots of valerian  D. Polemonium roots  E. Acorus calamus roots</p>	<p>Ginseng roots (<i>Panax ginseng</i>) contain triterpenoid saponins of the type of dammaran, which have a similar effect.</p>
4.	<p>On the base of <b>licorice root</b> different drug dosage forms are produced, notably tablets, powders, syrups, teas. The <b>only unused form is injection solution</b>. Licorice roots exhibit <b>haemolytic properties typical</b> for the following active substances:</p> <p>A. <b>Saponins</b>  B. Alkaloids  C. Essential oils  D. Iridoids  E. Polysaccharides</p>	<p>The hemolytic action of saponins is based on the ability to dissolve the lipoid part of the erythrocyte membrane, turning it from semi-permeable to permeable. As a result, hemoglobin from erythrocytes passes into a blood plasma.</p>

## Topic: Cardiac glycosides

1.	<p>Standard raw herbal material of <b>lily-of-the-valley</b> is obtained by <b>drying it at a temperature of 50-60 °C</b> in order to prevent the possibility of the following biochemical process:</p> <p><b>A. Enzymatic hydrolysis of cardiac glycosides</b>            B. Oxidation of phenolic compounds            C. Volatilization of essential oils            D. Oxidation of resins            E. Oxidation of terpenoids</p>	<p>Cardiac glycosides biological activity is lost after enzymatic hydrolysis. A temperature of 50-60 °C prevents enzymatic hydrolysis.</p>
2.	<p><b>Cumulating drugs</b> - Digitoxin and Cordigitum - are used to treat <b>chronic cardiac insufficiency</b>. What <b>plant</b> is used as a raw material to produce them?</p> <p><b>A. <i>Digitalis purpurea</i></b>            B. <i>Strophanthus kombe</i>            C. <i>Adonis vernalis</i>            D. <i>Convallaria majalis</i>            E. <i>Erysimum canescens</i></p>	<p><i>Digitalis purpurea</i> leaves contain cardioglycosides - derivatives of digitoxigenin (purpureaglycoside A and digitoxin). They are capable of cumulation. On the basis of these substances a drug was created such drugs as Digitoxin and Cordigitum.</p>
3.	<p>Preparations containing <b>cardiosteroids</b> are produced out of the following <b>raw herbal material</b>:</p> <p><b>A. <i>Herba Convallariae</i></b>            B. <i>Cortex Quercus</i>            C. <i>Radix Taraxaci</i>            D. <i>Folia Ficus Caricae</i>            E. <i>Folia Sennae</i></p>	<p><i>Herba Convallariae</i> contains cardioglycosides from the given list of MPM</p>
4.	<p>What <b>drug</b> from the group of <b>cardiac glycosides</b> can be used as an <b>alternative for strophanthine</b> if it is not available at a pharmacy?</p> <p><b>A. Corglycon</b>            B. Isolanidum            C. Digitoxin            D. Adonisidum</p>	<p>"Corglicon" - is the sum of cardioglycosides (convallatoxin, convalloside, convallotoxol) from the leaves of the lily of the valley (<i>Convallaria majalis</i>). It can be used as an alternative for strophanthine to treat acute heart failure because of the absence of cumulative properties due to</p>

	E. Celanidum	the presence of an aldehyde group.
5.	<p>A pharmaceutical company produces a medicine under the brand name "Corglyconum". What herbal raw material is used in preparation of this drug?</p> <p><b>A. Lily-of-the-valley grass</b>  B. Wormwood grass  C. Dandelion roots  D. Plantain foliage  E. Buckthorn bark</p>	
6.	<p>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:</p> <p><b>A. Round-leaved pyrola</b>  B. Spring adonis  C. Treacle-mustard (<i>Erysimum cheiranthoides</i>)  D. <i>Viola tricolor</i>  E. <i>Viola arvensis</i></p>	<p>Round-leaved pyrola (<i>Pyrola rotundifolia</i>) is morphologically close to Lily of the valley (<i>Convallaria majalis</i>). Round-leaved pyrola (<i>Pyrola rotundifolia</i>) flowers consist of calyx and corolla (corolla five-membered). Lily of the valley (<i>Convallaria majalis</i>) flowers has corolla with six petals, calyx is absent.</p>  <p><i>Pyrola rotundifolia</i> <i>Convallaria majalis</i></p>
7.	<p>One of the methods of quantitative analysis of active substances in the raw material is the <b>biological standardization</b>. It can be applied with the following group of biologically active substances:</p> <p><b>A. Cardiac glycosides</b>  B. Alkaloids  C. Fatty oils  D. Tannins</p>	<p>The quantitative method of biological standardization of cardiac glycosides is based on the determination of its' biological action on lab animals (cats, frogs, pigeons).</p> <p>For the unit of action, it takes the smallest amount of cardioglycoside, which causes a systolic stop of the heart for animals during 1 hour</p>

	E. Mucilages	
8.	<p>Cardioglycosides of <i>Adonis vernalis</i> are used for heart failure treatment. <b>This plant raw material should be stored:</b></p> <p><b>A. According to the list B</b>  B. According to the list A  C. Under normal conditions  D. Protected from CO<sub>2</sub>  E. In metal containers</p>	<p>Due to the high toxicity of cardiotoxic substances, MPM and drugs should be kept with caution (on the list B), separately from other MPM. Pure glycosides are stored on the list A.</p>
9.	<p><b>Digoxin</b> is given to the patients with chronic heart failure. <b>What medicinal plant that contains cardiac glycoside is a source of this medicinal substance?</b></p> <p><b>A. <i>Digitalis lanata</i></b>  B. <i>Erysimum canescens</i>  C. <i>Strophanthus kombe</i>  D. <i>Adonis vernalis</i>  E. <i>Convallaria majalis</i></p>	<p><i>Digitalis lanata</i> leaves contain cardioglycosides - derivatives of digitoxigenin (lanatozide A and digitoxin). They are capable of cumulation. On the basis of these substances a drug was created such drug as Digoxin</p>
10.	<p>To identify <b>cardiac glycosides</b> there are usually three groups of <b>color reactions</b> being performed: for steroid nucleus, for lactonic ring, and for carbohydrate component. <b>Specify the reaction for identification of butenolide ring:</b></p> <p><b>A. Legal's test</b>  B. Stahl's reaction  C. Mayer's test  D. Reaction of sublimation  E. Dragendorff's test</p>	<p>Legal's test occurs due to the ability of the lactone ring of cardioglycosides to be oxidized by polynetric compounds in an alkaline medium. The adding of sodium nitroprusside causes red staining.</p>

### Topic: Glycosides

1.	<p>A substance was received for analysis. The substance is a round seed 1-1,8 mm in diameter, yellow with bluish tint. When mashed with water, emits characteristic irritant odor; is sharp and acrid to taste. The</p>	<p>The given morphological description is typical for the mustard seeds (<i>Sinapis semina</i>)</p>
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	<p>material can be identified as:</p> <ul style="list-style-type: none"><li><b>A. Mustard seeds</b></li><li>B. Fenugreek seeds</li><li>C. Nigella seeds</li><li>D. Flax seeds</li><li>E. Plantago psyllium seeds</li></ul>	
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## Topic: Simple phenols

1.	<p>A patient came to a pharmacy to purchase <b>cowberry leaves</b>. Which of the available <b>herbal raw materials</b> can be offered as a <b>substitute</b>?</p> <p>A. <i>Folium Uvae ursi</i>            B. <i>Rhizoma Calami</i>            C. <i>Rhizoma et radix Sanquisorbae officinalis</i>            D. <i>Herba Achilleae millefolii</i>            E. <i>Radix Taraxaci officinalis</i></p>	<p><i>Folium Uvae ursi</i> (bearberry leaves) as <i>folium Vitis idaeae</i> (cowberry leaves) contain significant amount of arbutin. It is a phenoglycoside, which causes uroseptic action.</p>
2.	<p>A student has been prescribed a <b>tonic</b>. This may be the <b>tincture</b> of the following <b>medicinal plant</b>:</p> <p>A. <b>Rhodiola rosea</b>            B. Common yarrow            C. Java tea (<i>orthosiphon aristatus</i>)            D. Purple foxglove            E. Black locust</p>	<p><i>Rhodiolae roseae rhizomata et radices</i> contain salidroside (salidroside). It is a phenoglycoside, which causes tonic action.</p>

## Topic: Lignans, xanthenes, coumarins, chromones

1.	<p><b>Coumarins</b> are natural compounds with their structure based on an <b>benzo-alpha-pyrone</b> skeleton. What <b>reaction</b> is allowed to detect this group of compounds?</p> <p>A. <b>Lactone test</b>            B. Cyanide test            C. Iron (III) chloride reaction            D. Wilson's reaction            E. Trim-Hill reagent</p>	<p>The one of the characteristic features of coumarins as lactones is their specific action with an alkali. They are slowly hydrolyzed under the action of a dilute alkali and formed a yellow solution of salts of coumaric acid. Coumarins are regenerated to the original state with acidification of alkaline solutions or at their saturation by CO<sub>2</sub>.</p>
2.	<p><b>Ammifurinum</b> contains <b>furocoumarines</b>. These biologically active substances are derived from:</p> <p>A. <b>Fruits of large ammi</b>            B. Fruits of psoralea            C. Fruits of common parsnip            D. Fruits of toothpick ammi</p>	<p>Fruits of large ammi (<i>Ammi majus</i>) contain furocoumarins (xanthotoxin, imperatorin, bergapten). Ammifurinum is the drug based on furocoumarines of fruits of large ammi</p>

	E. Rhizomes and roots of angelica	
3.	Preparations made of <b>ginseng roots have tonic and adaptogenic properties, improve mental and physical performance.</b> If the ginseng tincture cannot be found in a pharmacy, <b>it can be substituted by the analogous preparations made of the following raw material:</b> <b>A. <i>Radices Eleutherococci</i></b> B. <i>Radices Valerianae</i> C. <i>Radices Inulae</i> D. <i>Radices Ononidis</i> E. <i>Radices Rhei</i>	<i>Radices Eleutherococci</i> (Siberian ginseng roots) contain lignans, which have a similar effect.
4.	Fruits of holy thistle ( <i>Silybum</i> ) are used for production of a number of domestic and foreign hepatoprotective drugs. Factor of merit of this raw material is content of: <b>A. Flavolignans</b> B. Coumarins C. Alkaloids D. Vitamins E. Terpenoids	<i>Silybi fructus</i> (milk thistle fruits) – <i>Silybum marianum</i> (milk thistle, holy thistle bearing) - contain flavolignans with the general name “silymarin” which have strong hepatoprotective action. According to the SPhU <i>Silybi fructus</i> are standardized by the content of flavolignan – silybin.
5.	Some domestic and foreign hepatoprotective activity preparations are made of holy thistle bearing. Purity of this material is determined by the content of: <b>A. Flavolignan</b> B. Coumarins C. Alkaloids D. Vitamins E. Terpenoids	
6.	A medicinal plant contains <b>hydroxycoumarins</b> and is used in production of <b>venotonic agents.</b> <b>Name the herbal raw material</b> harvested from this plant: <b>A. <i>Semina Hippocastani</i></b> B. <i>Herba Meliloti</i>	<i>Semina Hippocastani</i> contain hydroxy- and methoxycoumarins – esculin, esculetin, fraxetin, scopoletin – which have venotonic action.

	<p>C. <i>Fructus Ammi majoris</i>  D. <i>Fructus Pastinacae sativae</i>  E. <i>Fructus Dauci carotae</i></p>	
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### Topic: Anthraquinones, tannins

1.	<p>Preparations of <b>sorrel roots</b> can have both <b>laxative and astringent</b> effect. Such an effect results from the presence of the following <b>biologically active substances</b>:</p> <p><b>A. Anthracene derivatives and tannins</b>  B. Flavonoids and essential oils  C. Essential and fatty oils  D. Coumarins and phenol glycosides  E. Iridoids and vitamins</p>	<p>Sorrel roots (<i>Rumicis radices</i>) contain two groups of BAS, which predetermine its medicinal properties: anthracene derivatives have laxative effect and tannins have astringent effect</p>
2.	<p><b>Anthracene derivatives of emodin have purgative effect.</b> Large quantities of anthracene-derived groups of emodin are contained in the fruits of the following <b>plant</b>:</p> <p><b>A. Buckthorn</b>  B. Elder (<i>Sambucus</i>)  C. Blackcurrant  D. Blueberry (<i>Vaccinium myrtillus</i>)  E. Alder buckthorn (<i>Frangula alnus</i>)</p>	<p>Buckthorn fruits (<i>Rhamnus cathartica</i>) contain anthracene derivatives of emodin group and have purgative effect</p>
3.	<p><b>Tannins</b> can be used as an <b>antidote for alkaloid poisoning.</b> What <b>herbal remedy</b> should be applied in case of such intoxication:</p> <p><b>A. Cinquefoil root</b>  B. Calamus rhizome  C. Althaeae root  D. Rhizome and roots of madder  E. Elecampane root</p>	<p>Only cinquefoil roots (<i>Potentillae rhizomata</i>) is a source of tannins from the list below.</p> <p>Tannins are able to bind proteins and alkaloids, and also cause thickening of the cell membrane, which prevents the influence of toxins on vital organs.</p>
4.	<p><b>Tannins</b> have astringent effect and are used for treatment of colitis, enterocolitis, diarrhea. What <b>herbal raw material contains a lot of tannins?</b></p>	<p>Only <i>Myrtilli fructus</i> (bilberry) contain tannins in a significant amount from the list below.</p>



	<p>A. <i>Fructus Myrtilli</i>  B. <i>Fructus Sambucci nigri</i>  C. <i>Fructus Ribes nigri</i>  D. <i>Fructus Rhamni catharticae</i>  E. <i>Fructus Frangulae</i></p>	
5.	<p>Tanning agents of silverweed roots and rhizomes are used as an astringent. What species of silverweed is pharmacopoeial?</p> <p>A. <b><i>Potentilla erecta</i></b>  B. <i>Potentilla argentea</i>  C. <i>Potentilla pilosa</i>  D. <i>Potentilla impolita</i>  E. <i>Potentilla anserina</i></p>	<p><i>Potentilla erecta</i> (silverweed, cinquefoil) is present in SPhU.</p>
6.	<p>A phytochemical department of a pharmaceutical factory produces biogenic stimulators out of different raw materials. <b>Specify the plant-derived biogenic stimulators:</b></p> <p>A. <b>Liquid extract of aloe, aloe liniment, aloe juice, biosedum</b>  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</p>	<p>Liquid extract of aloe, aloe liniment and aloe juice contain biogenic stimulators of <i>Aloes arborescentis folia</i>. Biossedum is a biostimulator which is produced from <i>Sedi maximi herba</i></p>
7.	<p>Buckthorn bark and its derivative drugs are used as laxatives in medicine. <b>According to the State Pharmacopoeia of Ukraine during chromatographic identification of buckthorn bark it is necessary to detect:</b></p> <p>A. <b>Glucosfrangulin</b>  B. Panaxosides  C. Purpurea glycosides  D. Ginkgosides  E. Lanatosides</p>	<p>The quality of Buckthorn bark (<i>Frangulae cortex</i>) is made by the content of glucosfrangulin (according to SPhU)</p>


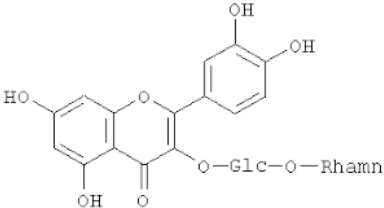
8.	<p>Several species of <i>Polygonum</i> genus are used in medicine. <b>One of these species has rootstocks rich in tanning agents, which are used to treat diarrhea.</b> Name this species:</p> <p><b>A. <i>Polygonum bistorta</i></b>  B. <i>Polygonum hydropiper</i>  C. <i>Polygonum persicaria</i>  D. <i>Polygonum alpinum</i>  E. <i>Polygonum aviculare</i></p>	<p>The rhizome (rootstock) is the MPM for <i>Polygonum bistorta</i> from the list below.</p>
9.	<p>Senna (casia) foliage contains <b>anthracene derivatives</b>. Their presence <b>can be confirmed by qualitative reaction with:</b></p> <p><b>A. Alkali</b>  B. Iron ammonium alum  C. Iron (II) sulfate  D. Febling's reagent  E. Molish's reagent</p>	<p>A specific reaction to anthracene derivatives is a reaction with alkali (cherry-red color)</p> <p>(foliage – folia)</p>
10.	<p>Specialists of a pharmaceutical enterprise confirm the identity of <i>Cassia acutifolia</i> herbal raw material. <b>During reaction with alkali it developed cherry-red coloring.</b> What substances were identified?</p> <p><b>A. Anthraquinones</b>  B. Alkaloids  C. Tannins  D. Iridoids  E. Glycosides</p>	
11.	<p>In the process of phytochemical examination of <b>buckthorn bark</b>, <b>the reaction with alkaline solution resulted in red coloring</b>, which indicates the presence of the following:</p> <p><b>A. Anthracene derivatives</b>  B. Saponins  C. Alkaloids  D. Flavonoids  E. Slime</p>	


12.	<p>What herbal bioactive substances yield a positive reaction with <b>ferric ammonium alum solution</b>?</p> <p><b>A. Tannins</b>  B. Saponins  C. Polysaccharides  D. Bitters  E. Fatty oils</p>	<p>A specific reaction to tannins is a reaction with ferric ammonium alum solution</p>
13.	<p>Proper harvesting of <i>Frangula alnus</i> herbal raw material greatly influences the quality and quantity of its active substances. Therefore <b>the optimal time for buckthorn bark harvesting</b> is the period of:</p> <p><b>A. Sap flow</b>  B. Fruiting  C. Flowering  D. Defoliation  E. Dormancy</p>	<p>Sap flow is the optimal time for bark harvesting. The largest amount of active substances is concentrated in bark in this period of vegetation.</p>
14.	<p><b>Spectrophotometric analysis of anthracene derivatives</b> contained in buckthorn bark is based on the following <b>reaction</b>:</p> <p><b>A. Production of phenolates with alkali ammonia solution</b>  B. Oxidation of anthracene derivatives  C. Anthraquinone reduction  D. Salt precipitation  E. Sublimation</p>	<p>A specific reaction to anthracene derivatives is a reaction with alkali. The formation of phenolates of cherry color is a result of reaction.</p>
15.	<p>What <b>effect</b> will <b>anthracene derivatives</b> have, if <b>-OH- groups are located in both benzene rings</b> of anthraquinone?</p> <p><b>A. Laxative</b>  B. Diuretic  C. Litholytic  D. Sedative  E. Choleric</p>	<p>According to the location of OH groups in a molecule, monomeric anthraquinones are divided into two groups: emodin derivatives (OH groups are located in both benzene rings of anthraquinone) and alizarin derivatives (OH groups are located in one benzene ring). Such a chemical structure affects the pharmacological action of anthraquinones: derivatives of the emodin have a laxative effect;</p>

derivatives of alizarin - nephrolithic action

## Topic: Flavonoides

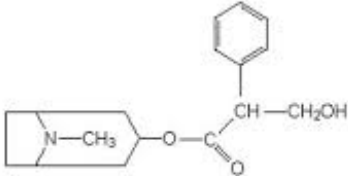
1.	<p>A patient with <b>heart failure</b> induced by long-term <b>coronary vessel disorder</b> can be administered a drug produced out of the following <b>raw herbal material</b>:</p> <p><b>A. Hawthorn berries</b>          B. Calendula flowers          C. Ginseng roots          D. Aralia roots          E. Berberis roots</p>	<p>Medicinal drugs from hawthorn fruits (<i>Crataegi fructus</i>) increase the heart force, regulate blood pressure, eliminate tachycardia and arrhythmia, normalize blood flow in the vessels of the brain. Such a pharmacological action is associated with the presence of flavonoids in the raw material (hyperoside, quercetin, rutine, kaempferol).</p>
2.	<p>Patients with <b>heart failure</b> caused by persisting <b>cardiac and coronary vessel dysfunction</b> can be recommended preparations produced from the following <b>herbal raw material</b>:</p> <p><b>A. Hawthorn fruits</b>          B. Calendula flowers          C. Ginseng roots          D. Aralia roots          E. Barberry roots</p>	
3.	<p>The main active components of <b>hawthorn berries</b> are <b>flavonoids</b>. What is their <b>pharmacological effect</b>?</p> <p><b>A. Hypotensive and sedative</b>          B. Laxative and sedative          C. Tonic and antispasmodic          D. Diuretic and styptic          E. Antispasmodic and antiinflammatory</p>	
4.	<p>A laboratory received some raw herbal material for analysis. The plant had <b>flowerheads up to 4 cm in diameter, marginal flowers were agamic, blue, funnel-shaped; the inner flowers were bisexual, purple, tubular. What plant has</b></p>	<p>The given morphological description is typical for the <i>Centaureae cyani flores</i></p>

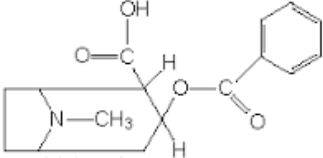
	<p><b>these features?</b></p> <p>A. <i>Centaurea cyanus</i>  B. <i>Solidago virgaurea</i>  C. <i>Polygonum persicaria</i>  D. <i>Scutellaria baicalensis</i>  E. <i>Viola tricolor</i></p>	
5.	<p><b>Rutin exhibits P-vitamin activity.</b> What <b>medicinal plant</b> is used as starting materials for the <b>industrial production of rutin?</b></p> <p>A. <i>Fructus Sophorae japonicae</i>  B. <i>Fructus Hippophaes rhamnoides</i>  C. <i>Flores Helichrysi arenarii</i>  D. <i>Herba Bidentis tripartitae</i>  E. <i>Herba Polygoni avicularis</i></p>	<p>“P-vitamin” is used to name flavonoids, which have capillary protective action. Rutin is a flavonol diglycoside, which has P-vitamin activity or capillary protective action.</p> 
6.	<p>Under the SPhU (appendix 2), <b>leaves of ginkgo are standardized by</b> the content of:</p> <p>A. <b>Flavonoids</b>  B. Saponins  C. Alkaloids  D. Coumarins  E. Chromones</p>	<p>The main biological active substances of ginkgo leaves (<i>Ginkgonis folia</i>) are flavonoids (luteolin, kaempferol, quercetin) and bioflavonoids (ginkgetin, isoginkgetin)</p>
7.	<p><b>Field horsetail grass</b> is recommend as a <b>diuretic</b>. What <b>herbal material</b> can be used as a <b>substitute?</b></p> <p>A. <i>Herba Aervae lanatae</i>  B. <i>Herba Leonuri</i>  C. <i>Herba Menthae piperitae</i>  D. <i>Herba Convallariae</i>  E. <i>Herba Adonidis</i></p>	<p><i>Herba Aervae lanatae</i> contains flavonoids and triterpene saponins. It is used as diuretic, hypoazotemic effect and can be a substitute for a field horsetail grass (<i>Equiseti arvensis herba</i>)</p>
8.	<p>A pharmacy has no <b>quinquelobate motherwort</b> in stock. It can be substituted by the following herbal material:</p> <p>A. <b>Rhizomes and roots of valerian</b>  B. Linden flowers  C. Beggarticks grass  D. Raspberry fruits  E. Hypericum grass</p>	<p>The quinquelobate motherwort (<i>Leonuri herba</i>) is used as sedative, hypotensive and spasmolytic. Rhizomes and roots of valerian (<i>Valerianae rhizomata cum radicibus</i>) have the same action from the list below.</p>

<p>9.</p>	<p>A drug raw material from the <b>family <i>Polygonaceae</i></b> had been sent to a laboratory for analysis. On macroscopic examination the material was identified as a herbaceous <b>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.</b> What plant is it?  <b>A. Redshank (<i>Persicaria</i>)</b>          B. Common knotweed          C. Biting knotweed          D. Snakeweed          E. Common buckwheat</p>	<p>The given morphological description is typical for the redshank (<i>Persicaria</i>) (<i>Polygonum persicariae</i> herb)</p> 
<p>10.</p>	<p>A certain herbal raw material is used to make <b>Flamin cholagogue</b>. Name this material:  <b>A. <i>Helichrysi arenarii</i> flores</b>          B. <i>Violae herba</i>          C. <i>Tanacetii flores</i>          D. <i>Crataegi flores</i>          E. <i>Meliloti herba</i></p>	<p><i>Helichrysi arenarii</i> flores contain flavonoids – salipurposide, isosalipurposide, luteolin, kaempferol, quercetin, that cause anti-inflammatory and choloretic. These compounds are the components of such drug as Flamin.</p>
<p>11.</p>	<p><b><i>Helichrysum arenarium</i></b> herbal raw material has anti-inflammatory and choloretic effect. What <b>parts of this plant are harvested?</b>  <b>A. Flowers</b>          B. Grass          C. Rhizomes          D. Fruits          E. Roots</p>	

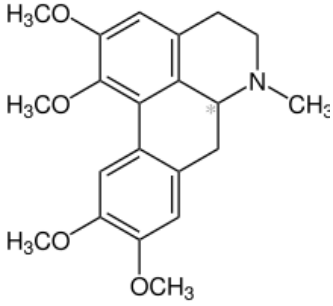
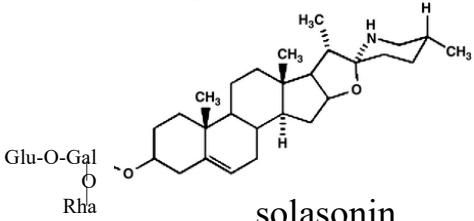
## Topic: Alkaloids


<p>1.</p>	<p>Specify which of the <b>alkaloids</b> given below will react positively to xanthenes (<b>murexide test</b>):  <b>A. Caffeine</b>          B. Atropine sulfate          C. Papaverine hydrochloride</p>	<p>The murexide test is a common reaction to purine alkaloids. It is based on the formation of salts of purple acid with the appearance of red or purple color. Only caffeine belongs to the purine alkaloids from the list below.</p>
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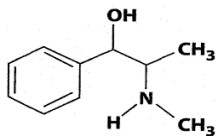
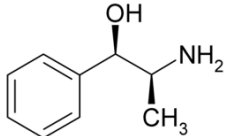
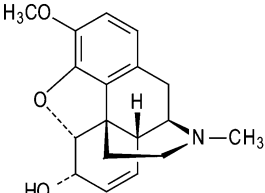
	D. Quinine sulfate E. Ephedrine hydrochloride	
2.	<b>Bellasthesin</b> is a spasmolytic drug used in treatment of gastrointestinal diseases. What <b>substance</b> contained in <i>Atropa Belladonna</i> provides such an effect of the drug? <b>A. Hyoscyamine</b> B. Morphine C. Codeine D. Reserpine E. Caffeine	Bellasthesin is a drug from tropane alkaloids of <i>Atropae belladonnae folia</i> . The main alkaloid from <i>Atropae belladonnae folia</i> is hyoscyamine.
3.	<b>Standardization</b> of a certain herbal raw material is done by calculating it's alkaloid content in terms of <b>hyoscyamine</b> . Name this herbal raw material: <b>A. Folia Belladonnae</b> B. <i>Radices Berberidis</i> C. <i>Herba Chelidonii</i> D. <i>Herba Thermopsidis lanceolatae</i> E. <i>Fructus Capsici</i>	<i>Folia Belladonnae</i> contain alkaloids. The main alkaloid is a hyoscyamine. 
4.	<b>Vitali-Morin's reaction</b> is used to identify <b>tropane alkaloids</b> in raw herbal material. Name the alkaloid that can be detected by this specific reaction. <b>A. Scopolamine</b> B. Codeine C. Morphine D. Platyphyllin E. Papaverine	Only scopolamine is tropane alkaloid that can be detected by Vitali-Morin's reaction from the list below.
5.	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 <b>tests for alkaloids the drug substance reacted positively with murexide</b> . Further identification of the drug substance should be	The murexide test is a common reaction to purine alkaloids. It is based on the formation of salts of purple acid with the appearance of red or purple color.

	<p>limited to the following group of derivatives:</p> <p><b>A. Purine</b>  B. Quinoline  C. Tropane  D. Isoquinoline  E. Indole</p>	
6.	<p>Medications <b>Passit and Novopassit</b> are used as tranquilizing, sedative and mild soporific agents. These medications are produced from the following grass:</p> <p><b>A. Purple passionflower</b>  B. Three-lobe beggarticks  C. Garden sage  D. Elecampane  E. Lesser periwinkle</p>	<p>Passit and Novopassit are plant drugs which are produced from the herb of purple passionflower (<i>Passiflora incarnata</i>). <i>Passiflorae incarnatae herba</i> contain indol alkaloids (garmin, garman etc.) and is used as sedative mild soporific agent.</p>
7.	<p>What <b>herbal drug</b> produced form <b>alkaloid-containing</b> raw materials can be recommended for <b>neurasthenia, insomnia, menopausal disorders</b>?</p> <p><b>A. Novopassit</b>  B. Ergotamine  C. Glaucine hydrochloride  D. Securinine nitrate  E. Vinblastine</p>	
8.	<p>Choose the substance that is a <b>tropane-derived alkaloid</b>:</p> <p><b>A. Cocaine</b>  B. Caffeine  C. Strychnine  D. Pilocarpine  E. Platyphyllin</p>	<p>Cocaine is belonged to tropane alkaloids from the list below.</p>  <p>The image shows the chemical structure of cocaine, which is a tropane alkaloid. It features a tropane ring system (8-azabicyclo[3.2.1]octane) with a methyl group on the nitrogen atom. The tropane ring is substituted at the 2-position with a tropane ester group, specifically a tropane-2-carboxylate ester of benzoic acid. The structure is drawn in a perspective view showing the tropane ring and the ester group.</p>
9.	<p><b>Vincamine alkaloid</b> reduces blood pressure, has a pronounced sedation effect, as well as hemostatic and anti-inflammatory effect. <b>What herb is the source</b> of this alkaloid?</p> <p><b>A. Common periwinkle</b>  B. Thick-fruited pagoda tree</p>	<p>Vincamine is an alkaloid than is reduced from the herb of common periwinkle (<i>Herba Vincae minoris</i>).</p>



	<p>C. Bluish larkspur D. Northern wolfsbane E. Yellow water-lily</p>	
10.	<p>Alkaloid <b>glaucine</b> has an antitussive effect that is stronger and longer if compared to that of codeine, and exhibits no narcotic side effects. What <b>medicinal plant contains glaucine</b>?</p> <p><b>A. Yellow hornpoppy</b> B. Celandine C. Thermopsis lanceolata D. Datura E. Henbane bell (<i>Scopolia carniolica</i>)</p>	<p>Glaucine is the main alkaloid of the herb of yellow hornpoppy (<i>Glaucii flavi herba</i>).</p> 
11.	<p>A certain <b>plant</b> is used for production of tinctures and extracts which are the part of <b>complex drugs Bellataminal, Becarbon, Besalol</b>, etc. Specify the grass that is used for this purpose:</p> <p><b>A. Belladonna</b> B. Lily of the valley C. Astragalus D. Beggarticks E. Celandine</p>	<p>Bellataminal, Becarbon, Besalol are based on the MPM of <i>Atropa belladonnae herba</i></p>
12.	<p>Representatives of the <b>family Solanaceae</b> are widely used in medical practice as alkaloid-containing plants. Which representative is <b>the source for production of semi-synthetic steroid hormones</b>?</p> <p><b>A. Solanum laciniatum</b> B. <i>Atropa belladonna</i> C. <i>Datura Stramonium</i> D. <i>Hyoscyamus niger</i> E. <i>Solanum tuberosum</i></p>	<p><i>Solani laciniati herba</i> contains glycoalkaloids of the steroidal structure - solasonin and solamagrin. Steran is in the basis of the structure of these alkaloids and they are the source for production of semi-synthetic steroid hormones</p>  <p style="text-align: center;">solasonin</p>
13.	<p>Select a <b>reagent</b> that should be applied by an analytical chemist in order to <b>detect alkaloids</b> in the herbal raw material:</p>	<p>Dragendorff reagent is used to detect alkaloids (precipitation reaction)</p>

	<p><b>A. Dragendorff reagent</b>  B. Bromine water  C. Alkaline solution  D. Stahl's reagent  E. Trim-Hill reagent</p>	
14.	<p>Most alkaloids are isolated from the biological material by means of polar solvents. Which of the listed <b>alkaloids</b> is isolated by the way of distillation with water vapour?</p> <p><b>A. Coniine</b>  B. Strychnine  C. Cocaine  D. Atropine  E. Quinine</p>	<p>Only a few alkaloids as coniine and nicotine is a volatile alkaloids and can be obtained by the way of distillation with water vapour</p>
15.	<p>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:</p> <p><b>A. <i>Datura stramonium</i></b>  B. <i>Passiflora incarnata</i>  C. <i>Chelidonium majus</i>  D. <i>Vinca minor</i>  E. –</p>	<p>The given morphological description is characteristic for the <i>Daturae stramonii folia</i></p> 
16.	<p>Analysis of an extract by chromatographic method revealed presence of <b>phenyl prapanolamine</b>. It is the <b>metabolite</b> of the</p>	<p>2-methylamino-1-phenylpropanol-1 is a systematic name of ephedrine. Phenyl prapanolamine is a metabolite of</p>

	following <b>alkaloid</b> : <b>A. Ephedrine</b> B. Pyrocatechin C. Aconitine D. Securinin E. Reserpine	<p style="text-align: center;">ephedrine.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>ephedrine</p> </div> <div style="text-align: center;">  <p>phenylpropanolamine</p> </div> </div>
17.	<b>Leaves of belladonna, henbane and datura containing tropane alkaloids must be stored according to the following list requirements:</b> <b>A. B list (these drug substances require caution in handling, storage or use)</b> B. A list (poisonous drug substances) C. General sales list D. Essential oil materials list E. List of substances equivalent to narcotics	Tropane alkaloids are poisonous substances. Therefore, the MPM, which contain alkaloids should be stored separately from other raw materials on the list B.
18.	<b>Codeine can be derived for medical purposes out of a plant alkaloid by means of semisynthetic method.</b> Name this alkaloid: <b>A. Morphine</b> B. Papaverine C. Berberine D. Protopine E. Chelidonine	Codeine is isoquinoline alkaloid of morphinan type with narcotic and antitussive activity. The main source of these alkaloids are poppy capsules ( <i>Papaveris capita</i> ). <div style="text-align: center; margin-top: 20px;">  </div>
19.	Drugs derived from <i>Rauvolfia serpentine</i> roots are used in hypertension treatment. Authenticity of <i>Rauvolfia serpentine</i> herbal raw material can be confirmed by its content of: <b>A. Reserpine</b> B. Atropine C. Hyoscyamine D. Vinblastine E. Adonitoxin	<i>Rauvolfia serpentine</i> contains indole alkaloids – ajmaline, reserpine, serpentine. <i>Rauvolfia serpentine</i> roots are used in hypertension treatment.
20.	<b>Vinblastine and Vincristine</b> demonstrate antitumor activity. Name the herbal raw material used in production of these medicines: <b>A. Folia Catharanthi rosei</b>	<i>Folia Catharanthi rosei</i> contains indole alkaloids vinblastine and vincristine. They demonstrate antitumor activity.

	<p>B. <i>Herba Vincaeminoris</i>  C. <i>Rhizomata Nupharislutei</i>  D. <i>Folia Berberidis</i>  E. <i>Herba Selaginis</i></p>	
21.	<p><b>Hyoscyamine and scopolamine</b> are typically contained in <b>the plants</b> of the following <b>family</b>:</p> <p><b>A. <i>Solanaceae</i></b>  B. <i>Asteraceae</i>  C. <i>Papaveraceae</i>  D. <i>Apocynaceae</i>  E. -</p>	<p>Hyoscyamine and scopolamine are alkaloids of MPM of <i>Atropa belladonna</i>, <i>Hyoscyamus niger</i>, <i>Datura stramonium</i>, <i>Datura innoxia</i>. All these plants belong to <i>Solanaceae</i> family.</p>
22.	<p><i>Atropa belladonna</i> grass extract is a component of compound <b>antispasmodic drugs</b>. Select such drug from the list:</p> <p><b>A. Bellasthesin</b>  B. Olimetinum  C. Solutan  D. Urolesan  E. Herbogastrine</p>	<p>Bellasthesin is an antispasmodic drug is based on tropane alkaloids of <i>Atropae belladonnae herba</i></p>

### Topic: Batch analysis

1.	<p>A pharmaceutical warehouse has received a batch of herbal raw material – hawthorn flowers. Merchandise analysis revealed in one of the sacks significant amount of <b>bird-cherry flowers besides the hawthorn. What quality assessment</b> of the herbal raw material should be performed?</p> <p><b>A. Acceptable admixtures</b>  B. Extractive values  C. Ash values (Total ash)  D. Moisture content  E. Mineral admixtures</p>	<p>Bird-cherry flowers (<i>Padus racemosa</i>) contain tannins, flavonoids, organic acids and do not containe poisonous compounds. They are acceptable admixtures to hawthorn flowers (<i>Crataegi flores</i>).</p>
2.	<p>Admixtures can get into the herbal raw material during harvesting, drying and</p>	<p>Sand, earth, stones are mineral admixtures, all the rest is given -</p>

<p>primary processing. <b>Mineral admixtures</b> include:</p> <p><b>A. Sand, earth, stones</b>  B. Metal objects  C. Other similar plants  D. Droppings of birds and rodents  E. Other organs of the same plant</p>	<p>organic admixtures.</p>
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### Topic: Medicinal plant resources

<p>1.</p>	<p>Adonis-derived drugs are popular cardiotoxic agents. <b>The stock of adonis herbal raw material is assessed by the method of:</b></p> <p><b>A. Model specimen</b>  B. Geodesic  C. Permanent quadrates  D. By eye  E. Projective cover</p>	<p>For resource estimates of shrub and woody plants (sometimes grassy, especially tall), the method of model instance is used.</p>
<p>2.</p>	<p><b>Motherwort grass</b> is a component of hypotensive and sedative drugs. This herbal raw material <b>should be harvested</b> taking into account its renewal rate. Therefore it can be harvested:</p> <p><b>A. Once every 5 years</b>  B. Once every 2 years  C. Once every 3 years  D. Once every 10 years  E. Every year</p>	<p>To save thickets of motherwort grass (<i>Leonuri herba</i>), it is necessary to take into account the periodicity of possible raw material harvesting - once every 5 years</p>
<p>3.</p>	<p>To determine the quantity of wild growing medicinal plants, it is necessary to know their area of vegetation and yield per unit area. <b>Yield of <i>Thymus serpyllum</i> grass can be determined</b> by the following method:</p> <p><b>A. Projective cover method</b>  B. Permanent quadrat method  C. Visually  D. Model sample method  E., Geodesically</p>	<p>Projective cover method is used when taking into account the raw materials of herbaceous and shrub plants that form thick thickets. These plants include <i>Thymus serpyllum</i></p>