

**Ministry of health of the Republic of Belarus  
Educational institution  
«Gomel State Medical University»**

Department of general and clinical pharmacology

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**METHODOLOGICAL RECOMMENDATIONS**

for a practical lesson on the discipline "Pharmacology"  
for the third-year students of the Faculty of Foreign Students,  
studying at the specialty 1-79 01 01 "General medicine"

**TOPIC 2: «LIQUID DOSAGE FORMS»**

Time: 3 hours

Approved at the meeting of the department of general and clinical pharmacology  
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## **LEARNING AND EDUCATIONAL GOALS, OBJECTIVES, MOTIVATION FOR LEARNING THE TOPIC**

In practical medicine, medicinal products in liquid dosage form are now widely used. Due to its undoubted advantages, this form has great prospects for future use in the development of new medicines. For this reason, the study of this topic is very appropriate for all medical students, regardless of their chosen specialisation.

### **Learning objective:**

– formation of scientific knowledge about the main pharmacological effects, providing therapeutic and preventive effect of drugs on the topic of the class, indications and contraindications for their use, the interaction of drugs, their combined use for use in medical and preventive activities.

### **Educational purpose:**

– to develop their value-personal, spiritual potential, to form the qualities of a patriot and citizen, ready for active participation in the economic, industrial, socio-cultural and public life of the country; to realize the social significance of their future professional activities, to learn to follow academic and work discipline, standards of medical ethics and deontology.

### **Tasks:**

As a result of the study lesson, the student should

#### **know:**

– classification and basic characteristics of the studied drugs, pharmacodynamics and pharmacokinetics, indications and contraindications for their use, side effects;  
– features of pharmacokinetics and pharmacodynamics, advantages and disadvantages of different dosage forms of these drugs;  
– principles of research and testing of new drugs; information and reference and search systems;

#### **be able to:**

– analyze the effect of the studied drugs on the set of their pharmacological properties and the possibility of their use in medical practice; to write them in prescriptions;  
– use different dosage forms of these drugs, based on the peculiarities of their pharmacodynamics and pharmacokinetics;  
– work with scientific literature, search for information about the use and action of the studied drugs;

#### **possess:**

– skills in choice of drugs on the topic of the lesson;  
– the rules of prescribing the studied drugs in the treatment of various diseases and pathological conditions, taking into account the indications;  
– skills of dosage regime correction in case of pathological changes in functions of organs or systems responsible for biotransformation and elimination of drugs or in case of joint use of different drugs;  
– skills to search, analyze and summarize information about the use and effects of the studied drugs.

### **Motivation for learning the topic:**

– the specifics of training doctors in this specialty determines the need for students to purposefully study the main pharmacological effects, providing therapeutic and preventive effects of drugs on the topic of the class, indications and contraindications for their use, the interaction of drugs, their combined use, which will successfully complete the specialized disciplines of the specialty.

### **MATERIAL EQUIPMENT**

Reference and informational literature, charts, tables, presentations, drug collections.

### **CONTROL QUESTIONS FROM RELATED DISCIPLINES**

1. Latin terminology: dosage forms, commonly accepted abbreviations.
2. Case endings of Latin nouns I, II, III, IV, V declensions in the genitive case.

### **CONTROL QUESTIONS ON THE TOPIC OF THE CLASS**

1. Liquid dosage forms. General characteristics and rules for dispensing liquid dosage forms. Dosage.
2. Solutions for external use and oral administration. Solvents. Ophthalmic solutions. Suspensions.
3. Liquid dosage forms prepared from herbal medicine: infusions, decoctions, gatherings, galena and novogalenic preparations, slurries, emulsions, liniments. Mixtures.

### **PROCESS OF THE STUDY**

- 1.
- 2.
- 3.
- 4.
- 5.

#### **Theoretical part**

Liquid dosage forms are solutions, mucus, emulsions, suspensions, infusions and decoctions, tinctures, liquid extracts, syrups, elixirs, etc.

***Solutions – Solutiones*** (Nom. *Single – Solutio*, Gen. *Single – Solutionis*).

***Solution*** is a homogeneous mixture composed of two or more substances. In such a mixture, a solute is a substance dissolved in another substance (solvent). As a solvent, purified water (*Aqua purificata*) is most commonly used, less commonly – ethyl alcohol (*Spiritus aethylicus*) 70%, 90%, 95%, glycerol (*Glycerinum*) and liquid oils: vaseline, olive, peach (*Oleum Vaselini*, *Oleum Olivarium*, *Oleum Persicorum*). Accordingly, there are aqueous, alcohol, glycerine and oily solutions.

True solutions are always transparent. They do not contain suspended particles and sediment. There are solutions for external and internal use and for injection.

#### ***Solutions for topical administration***

There are ear drops, eye drops, nasal drops and sprays, mouthwashes, etc. Drops are usually supplied by 5-10 ml, other solutions – by 50-100 ml and more.

Solutions may be prescribed in a short form or an extended one.

*Short forms* are used for prescribing solutions where solvent (liquid oil or alcohol of a certain concentration) is determined by factory technology or can be chosen by a pharmacist.

When prescribing aqueous solutions we write **Rp.:** (Take:), then dosage form in Gen. – **Sol.** ... (Solution...), medicinal substance, solution concentration and volume in ml (be attentive – we don't indicate that solution is aqueous), then **D.S.** (Give. Mark.). Then we write how to use this drug (signature).

**Table 1. How to indicate concentration**

- |   |                    |
|---|--------------------|
| <ul style="list-style-type: none"> <li>• Percent. <b>Sol. Furosemidi 1 % – 1 ml.</b></li> <li>• Degree of dilution. <b>Sol. Adrenalini 1:1000.</b></li> <li>• Mass-volume ratio. <b>Sol. Natrii Chloridi 9.0 – 100 ml.</b></li> </ul> | <i>Most common</i> |
|---|--------------------|

### Examples

1) Prescribe 500 ml of 0,02% aqueous furaciline solution (Furacilinum). To clean the wound.

*Concentration of solution in percent*

Rp.: Sol. Furacilini 0,02% – 500 ml

D.S. To clean the wound od.

*We should indicate the frequency of administration*

*tion*

*Concentration of the solution in the ratio*

Rp.: Sol. Furacilini 1:5000 - 200 ml

D.S. Gargle tid.

! When prescribing *oily* or *alcohol* solutions we should indicate it after the name of the drug: *oleosae* (oily) or *spirituosae* (alcohol), then concentration and volume, D.S. and signature.

### Examples

1) Prescribe 100 ml of 10% oily camphor solution (Camphora). To be rub into the joint.

Rp.: Sol. Camphorae oleosae 10% - 100 ml

D.S. To be rub into the joint tid.

2) Prescribe 50 ml of 1% alcohol solution of brilliant green (Viridinitens). To paint affected skin 1 time daily.

Rp.: Sol. Viridis nitentis spirituosae 1% - 50 ml

D.S. To paint affected skin od.

When prescribing solutions containing a definite solvent (liquid oil or alcohol of a particular concentration) only extended form is possible. In this case we indicate the solute and its quantity separately, then the solvent and its amount. Then **M.D.S.** (Misce. Da. Signa. – Mix it up. Give. Mark) and the signature.

### Example

1) 50 ml of 10% anesthesin solution (Anaesthesinum) in vaseline oil (Oleum Vaselini). To be applied to wound surface

Rp.: Anaesthesini 5.0

Ol. Vaselini ad 50.0

M.D.S. Apply to wound tid.

Particle «ad» means «up to». It means the solvent should be added to the solute till completing the total amount of the solution.

As eye drops (Guttae ophthalmicae), aqueous or oily solutions of medicinal substances can be used. They are prescribed like internal use solutions. They are dropped into the conjunctival cavity by 1-2 drops.

Officinal solutions are usually prescribed without the indication of concentration (only the name of the solution and its quantity are given).

### Examples

1) 100 ml of an official solution of hydrogen peroxide (Solutio Hydrogenii peroxydi diluta). To rinse the mouth (1 tablespoonful for a glass of water).

Rp.: Sol. Hydrogenii peroxydi dilutae 100 ml

D.S. Dilute 1 tablespoon in a glass of water. Rinse the mouth tid.

### *Solutions for oral administration*

Aqueous solutions for internal use are prescribed for 3-4 days for 10-12 intakes. They are administered by 5-15 ml (measured by graduated cups or tea, dessert or table spoons) and drops. Before use, the drops are diluted with a small amount of water or milk (oily solutions).

**Table 2. Volume of spoons**

1 teaspoonful	5 ml
1 dessertspoonful	10 ml
1 tablespoonful	15 ml
1 ml=20 drops	
(1 drop=0.05 ml)	

A single dose should contain in a volume of solution for a single administration.

Concentration and total amount of solution should.

### Examples

1) Prescribe calcium chloride solution (Calcii chloridum) for 4 days this way: patient should take 1 dessertspoon receiving 1.0 g of calcium chloride per dose. To take 1 dessert spoon 3 times a day after meals.

*Calculation of the solution concentration in percent:* 1 dessertspoonful (10 ml) contains 1.0 g of substance, so 100 ml contains 10 g – concentration is 10%.

*Calculation of the amount of solution.* The patient will take 1 teaspoonful 3 times daily during 4 days, totally 12 spoons. 1 tablespoonful contains 10 ml. Therefore, the total amount of the solution is 120 ml.

Rp.: Sol. Calcii chloridi 10% – 120 ml

D.S. 1 tbsp tid after meals.

When we know the volume of solution we calculate only its concentration.

### Examples

1) Prescribe 180 ml of sodium bromide solution (Natrii bromidum) this way: the patient should take 1 tablespoon receiving 0.15 g of sodium bromide. 1 tablespoon 3 times a day after meals.

*Calculation of the solution concentration in percent:* 1 tablespoonful (15 ml) contains 0.15 g of sodium bromide. Concentration is 1%.

Rp.: Sol. Natrii bromidi 1% – 180 ml

D.S. 1 tbsp 3 tid after meals.

2) Prescribe 10 ml of solution of atropine sulfate (Atropini sulfas) with the next concentration: a patient should take 10 drops and get 0.0005 g of atropine sulfate. 10 drops 3 times daily orally.

*Calculation of the solution concentration in percent:* 10 drops (0.5 ml) contain 0.0005 g of atropine sulfate. 50 ml contain 0.05 g of atropine sulfate, 100 ml contain 0.1 g. Concentration is 0.1%.

Rp.: Sol. Atropini sulfatis 0.1%- 10 ml

D.S. 10 drops tid orally.

### ***Mucilages – Mucilagines (Nom. Single – Mucilago, Gen. Single – Mucilaginis)***

Mucilages are viscous preparations usually employed as emulsifying or suspending agents, or as demulcents.

Mucilages which are not in constant demand should be freshly prepared as required. They deteriorate when kept, especially in warm weather, unless preservatives are added, such as solution of formaldehyde (10 minims to each pint) or benzoic acid (10 grains to each pint).

Mucilage is obtained by dissolving vegetable mucous substances or by obtaining mucous substances from plant raw materials by infusion. It is also obtained from starch when dissolving in hot water.

Mucilages of Apricot gum (Mucilago Gummi Armeniacae), gum Arabic/acacia gum (Mucilago Gummi arabici), Althea root (Mucilago radice Althaeae) and starch (Mucilago Amyli) are used. (Gums are polysaccharides of natural origin, capable of causing a large increase in a solution's viscosity, even at small concentrations).

Concentration isn't indicated in the prescription. We write only the name of the mucilage and its amount.

### **Example**

1) Prescribe a mixture containing 1.5 g of chloral hydrate (Chloralum hydratum) and 50 ml of mucilage of starch (Mucilago Amyli) and water (Aqua purificata) equally. For one enema.

Rp.: Chlorali hydrati 1,5

Mucil. Amyli

Aq. purif. aa 25 ml

M.D.S. 50 ml per colon as enema od in the evening.

Mucilages are usually used in combination with irritants.

Mucilages are often a part of mixtures containing insoluble substances. Due to the thick (viscous) consistency of mucilage, insoluble substances are kept in a suspended state for a long time.

Alcohol preparations, acids and alkalis can not be prescribed simultaneously with a mucilage cause they provoke denaturation.

### ***Suspensions – Suspensiones (Nom. Single – Suspensio, Gen. Single – Suspensionis)***

**Suspension** is a heterogeneous mixture containing solid particles. It has a dispersed phase (the suspended particles of insoluble medicinal substances) and a continuous phase (the medium of suspension like water, oil, glycerin).

They are administered topically and orally. Some of them can be administered parenterally (intramuscularly or into the body's cavities).

Suspensions are prescribed in a short form. First we write **Susp.** (Suspensionis), then a medicinal substance, concentration and amount are given. If continuous phase is water we don't write it. Then we write **D.S.** and a signature. In Sign. we indicate a single dose, rout and frequency of administration and write: «Shake before use». You can buy ready-to-use suspensions with labels on the pack with the same indications.

*Colloid* is an intermediate conception between a solution (whose solute and solvent are homogenic and constitute only one phase) and a suspension (it's heterogenic but its suspended particles are bigger). It also has a dispersed phase (the suspended particles) and a continuous phase (the medium of suspension). Homogeneous mixtures with a dispersed phase in this size range may be called *colloidal aerosols, colloidal emulsions, colloidal foams, colloidal dispersions, or hydrosols*.

### Example

1) Prescribe 10 ml of aqueous suspension of 0.5% hydrocortisone acetate (Hydrocortisoni acetatis). 2 drops to be dropped into the conjunctival cavity 3 times a day. Shake before use.

Rp.: Susp. Hydrocortisoni acetatis 0.5% - 10 ml

D.S. 2 drops into the conjunctival cavity tid.

Shake before use.

Ready-to-use suspensions (a pharmacist doesn't make them up by himself but just sell) are prescribed in a short form. Concentration *aren't given* (for exception if there are a few variants of concentrations).

### Example

1) Prescribe 100 ml of griseofulvin (Griseofulvinum) suspension. 1 dessert spoon 3 times a day. Shake before use.

Rp.: Susp. Griseofulvini 100 ml

D.S. 1 dessertsoonful tid. Shake before use.

If continuous phase isn't water but oil, glycerin, etc, we indicate it after the medicinal substance in Gen. (glycerinosae, oleosae).

### Example

1) Prescribe 50 ml of sterile vaseline oil (Oleum Vaselini) suspension containing 0.5% trichomonacid (Trichomonacidum). 10 ml to be administered into the bladder. Shake before use.

Rp.: Trichomonacidi 0.25

Ol. Vaselini ad 50.0

M.f. susp.

Steril.!

D.S. 10 ml to be administered into the bladder. Shake before use.

### *Emulsions for oral administration*

**Emulsa ad usum internum** (Nom. Single – Emulsum, Gen. Single – Emulsi)

An **emulsion** is a mixture of two or more liquids that are normally immiscible. Although the terms *colloid* and *emulsion* are sometimes used interchangeably, *emulsion* should be used when both phases, dispersed and continuous, are liquids. Familiar examples are homogenized milk and mayonnaise.

There are water and oil emulsions. These emulsions include creams, ointments, liniments (balms), pastes, films, or liquids, depending mostly on their

oil-to-water ratios. A highly liquid emulsion may be used orally, or may be injected in some cases. Popular medications occurring in emulsion form include cod liver oil, Polysporin (antibiotic), cortisol cream, Canesten (antifungal medication clotrimazole) and Fleet (a laxative containing bisacodyl).

Microemulsions are used to deliver vaccines and kill microbes. Typical emulsions used in these techniques are nanoemulsions of soybean oil. The smaller the droplet the greater the surface tension and thus the greater the force required to merge with other lipids. The oil is emulsified with detergents using a high-shear mixer to stabilize the emulsion so, when they encounter the lipids in the cell membrane or envelope of bacteria or viruses, they force the lipids to merge with themselves. On a mass scale, in effect this disintegrates the membrane and kills the pathogen.

The soybean oil emulsion does not harm normal human cells, or the cells of most other higher organisms, with the exceptions of sperm cells and blood cells. For this reason, these nanoemulsions are not currently used intravenously (IV). The most effective application of this type of nanoemulsion is for the disinfection of surfaces.

**Oil emulsions** are made of liquid oils: castor (Oleum Ricini), almond (Oleum Amygdalarum), fish-fat (Oleum jecoris Aselli) and others.

Oil emulsions are prescribed in a short form. First we write **Emuls.** (Emulsi), then the name of the oil, its amount and total amount of emulsion are given. Then we write **D.S.**

#### Example

1) Prescribe 200 ml emulsion containing 30 ml of fish oil (Oleum jecoris Aselli). Two intakes.

Rp.: Emuls. ol. jecoris Aselli 30 ml - 200 ml

D.S. 100 ml orally 2 tid.

**Infusions and decoctions – Infusa et Decocta** (Nom. Single – Infusum, Gen. Single – Infusi, Nom. Single – Decoctum, Gen. Single – Decocti)

*What's the difference?*

• **Infusion** is a liquid made by extracting chemical compounds or flavors from plant material in a solvent such as water, oil or alcohol. It's made of soft parts of the herbs (flowers, leaves, fruits). (*Tea is an infusion*).

• **Decoctions** involve boiling the plant material because they are made of stems, roots, bark and rhizomes. (*Coffee is an decoction*).

Infusions and decoctions are made in pharmacies immediately before a patient buy them. Also they may be made at home as a part of *traditional medicine*. They are quickly decomposed, so they are prescribed for 3-4 days and are recommended to be stored in a cool place.

Infusions and decoctions are administered orally or topically (rinse the mouth, eg.). If taken orally they are dosed by table, dessert, tea spoons and graduated cups.

**Table №1. Parts of plants for infusions and decoctions**

Part	Nom. Single	Gen. Single	Recommended abbreviation
Bark	cortex	corticis	cort.
Root	radix	radicis	rad.
Rhizome	rhizoma	rhizomatis	rhiz.
Leaf	folium	folii	fol.
Grass	herba	herbae	herb.



Flower	flos	floris	fl.
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Infusions and decoctions are prescribed only in a short form and the amount of medicinal raw material and total amount of the preparation are given. After the name of the dosage form - *Infusi...*(Infusion...), *Decocti...*(Decoction...) - indicate the parts of the plant (leaves, bark, rhizome with roots, etc.), the name of the plant, the amount of medicinal raw materials in grams and write after the dash the total amount of infusion or decoction in ml. Then *D.S.* (Give. Mark) and signature follow.

### Example

1) Prescribe 180 ml of infusion made of 0.6 g herbs of thermopsis (herba *Thermopsisidis*). 1 A tablespoon 3 times a day.

Rp.: Inf. herb. *Thermopsisidis* 0.6 – 180 ml

D.S. 1 tbsp 3 tid.

In the necessary concentration of decoctions/infusions is given in the state pharmacopoeia (eg., 1:30 for infusions of *Adonis vernalis* herb, rhizomes with roots of valerian, etc.) we need the conversion of concentration in mass-volume units.

### Example

1) Prescribe infusion of *Adonis vernalis* herb (concentration 1:30) to be taken during 3 days. (1 tablespoon 4 times daily).

*Calculation.* First of all we should calculate the total amount of infusion. If the infusion should be taken 1 tablespoon 4 times a day for 3 days, the total amount of the infusion is 12 tablespoons, that is 180 ml. Then you need to calculate the amount of medicinal raw material (*Adonis vernalis* herb). If the concentration of infusion is 1:30, it means that 30 ml of infusion are prepared from 1.0 g of herb grass; to prepare 180 ml of infusion, 6.0 g of medicinal raw material is required.

Rp.: Inf. herb. *Adonidis vernalis* 6.0 - 180 ml

D.S. 1 tbsp 4 tid.

If vegetable raw materials have low activity decoctions/infusions have 1:10 concentration: 1 part of the plant raw materials is needed for 10 parts of a decoction. In this case, *the amount of plant material in the recipes isn't needed to be indicated.*

### Example

1) Prescribe 200 ml of oak bark decoction (cortex *Quercus*). To rinse the mouth.

Rp.: Dec. cort. *Quercus* 200 ml

D.S. To rinse the mouth 4 tid.

The pharmacist in the pharmacy will take 20.0 g of oak bark for this decoction.

***Galenical preparations*** are tinctures and extracts (medicines prepared by extracting one or more active constituents of a plant).

***Tinctures – Tincturae*** (*Tincture - Nom. Single Tinctura,*  
*Gen. Single Tincturae*)

***Tincture*** is an alcoholic extract of plant or animal material or solution of such.

To qualify as an alcoholic tincture, the extract should have an ethanol percentage of at least 25–60%. Other solvents include vinegar, glycerol, diethyl ether and propylene glycol, not all of which can be used for internal consumption (!). Ethanol has the advantage of being an excellent solvent for both acidic and basic (alkaline) constituents.

In contrast to infusions and decoctions tinctures are a stable dosage form and can be stored for a long time.

The concentrations of all the tinctures are given in pharmacopoeia – that's why we don't indicate them or parts of plants in the prescription. First we write the dosage form - *Tincturae*...(Tincture...), then the name of the plant and the preparation amount. Tinctures are taken by drops (usually 5-30 drops at once). That's why the total amount of tinctures is usually 5-30 ml only.

### **Example**

1) Prescribe 25 ml of valerian tincture (Valeriana). Take 25 drops 3-4 times daily.

Rp.: Tinct. Valerianae 25 ml

D.S. 25 drops 3 tid daily orally.

*But what if we have a mixture made of 2 tinctures?*

2) Prescribe 20 ml of a mixture containing tinctures of lily of the valley (Convallaria) and valerian (Valeriana) equally. Take 20 drops 3 times daily.

Rp.: Tinct. Convallariae

Tinct. Valerianae aa 10 ml

M.D.S. 20 drops 3 tid daily orally.

### **Extracts - Extracta** (*Extract - Nom. Single Extractum, Gen. Single Extracti*)

**Extract** is a concentrated substance made by extracting a part of a raw material often by using a solvent such as ethanol or water.

Depending on the consistency, the extracts can be liquid (Extractum fluidum), thick (Extractum spissum) and dry (Extractum siccum).

Thick extracts - <25% of liquid part.

Dry extracts - <5% of liquid part.

When prescribing extracts you don't need to indicate concentration in the prescription.

First we write the name of the dosage form - *Extracti*...(Extract...) – then the name of the plant, the type of the extract - *fluidi* (liquid) and its amount. Then D.S. and signature. Liquid extracts are dosed in drops and sold in ml, thick extracts are prescribed in capsules, dry extracts – in powders, tablets, suppositories.

### **Example**

1) Prescribe 20 ml of liquid Frangula (Frangula) extract. Take 20 drops 3 times daily.

Rp.: Extr. Frangulae fluidi 20 ml

D.S. 20 drops orally 3 tid.

### **Non-galenical preparations**

Non-galenicals are obtained after special treatment of plant medicinal raw materials. They are highly purified from ballast substances and contain mainly the sum of the active substances of the plant. In this regard, they are prescribed not only for oral administration, but also parenterally.

Only the name of the preparation and its amount is given in the prescription.

### **Example**

1) Prescribe 15 ml of adoniside (Adonisidum). Take 15 drops 3 times daily.

Rp.: Adonisidi 15 ml

D.S. 15 drops 3 tid orally.

### **Mixtures – Mixturae** (*Nom. Single – Mixtura; Gen. Single – Mixturae*)

**Mixture** is a liquid dosage form for internal use, consisting of a mixture of several solids or liquids (infusions, decoctions, solutions, extracts, etc.)

### Example

1) Prescribe 180 ml of a mixture containing codeine phosphate (Codeini phosphas, single dose is 0.015 g) and potassium bromide (Kalii bromidum, single dose is 0.3 g). 1 tablespoon 3 times daily.

Rp.: Codeini phosphatis 0.18

Kalii bromidi 3.6

Aq. purif. ad 180 ml

M.D.S. 1 tbsp 3 tid.

or

Rp.: Codeini phosphatis 0.18

Sol. Kalii bromidi 2 % - 180 ml

M.D.S. 1 tbsp 3 tid.

2) Prescribe a mixture containing infusion of Adonis vernalis herb (herba Adonidis vernalis) 1:30, sodium bromide (Natrii bromidum), single dose 0.5 g, and codeine phosphate (Codeini phosphas), single dose is 0.01 g. There are 12 single doses in the mixture. Take 1 tablespoon 3 times daily.

Rp.: Codeini phosphatis 0.12

Inf. herb. Adonidis vernalis 6.0 - 180 ml

Natrii bromidi 6.0

M.D.S. 1 tbsp 3 tid.

### Other liquid dosage forms

Other liquid dosage forms are medical oils, juices of fresh plants, liquid organopreparations, medicinal syrups.

**Medical oils** are oily extracts of medicinal plants, for example, bleached oil (Oleum Hyoscyami), St. John's wort oil (Oleum Hyperici), rose hips oil (Oleum Rosae), sea buckthorn oil (Oleum Hippophaeae).

**Juices:** among the medicines, we can mention the juice of the plantain (Succus Plantaginis), the juice of the Kalanchoe (Succus Kalanchoes), the juice of the aloe (Succus Aloes), etc.

**Liquid organopreparations** are liquid extracts from the tissues of slaughter cattle. Examples: parathyroidin (Parathyreoidinum) – an extract from parathyroid glands of slaughter cattle, etc.

**Medicinal syrups** are mixtures of extracts of medicinal plants with sugar syrup. For example, the Altein Syrup (Sirupus Althaeae) consists of 2 parts of the dry extract of the altite root and 98 parts of the sugar syrup.

### Practical part

1. Take notes on theoretical material demonstrated by the teacher.
2. Master the methods of solving the tasks and writing out prescriptions on the topic of the class.

### Theme learning control

Conducted in the form of independent written work (solution of practical problems and prescriptions for individual task).

## **METHODOLOGICAL RECOMMENDATIONS FOR ORGANIZATION AND EXECUTION OF STUDENTS' INDEPENDENT WORK (SIW)**

**The time given for independent work can be used by students for:**

- preparing for the practical classes;
- completing the tasks on the topic of the class in the workbook;
- preparing thematic reports, essays and presentations;
- taking notes from academic literature.

**The main methods of organizing independent work:**

- completing tests and practical tasks of the electronic educational-methodical complex (EEMC) for self-monitoring and self-assessment.

**The list of tasks of the SIW:**

- solving practical problems in the EEMC;
- completing the test tasks of the EEMC.

**Control of the SIW is carried out in the form of:**

- assessment of an oral answer to a question, report, report, or solution of a task in a practical class;
- individual conversation.

## **METHODOLOGICAL RECOMMENDATIONS FOR ORGANIZATION AND EXECUTION OF CONTROLLED INDEPENDENT WORK OF STUDENTS (CIWS)**

**Recommended forms of CIWS organization:**

- doing exercises on the topic of the class in the workbook;
- writing an essay on a given topic;
- preparing a report and a multimedia presentation on a given topic.

**The list of tasks of the CIWS:**

Topics of essays / multimedia presentations:

1. Vegetable juices. General characteristics and main representatives.
2. Modern aerosols. Application in various fields of medicine.

**Forms of control of CIWS realization:**

- checking and grading an essay on a given topic;
- checking and grading a multimedia presentation on a given topic.

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