



**NATIONAL UNIVERSITY OF PHARMACY**  
**TECHNOLOGY OF DRUGS DEPARTMENT**



Discipline “Pharmacy-based technology of drugs”

*The topic of the lecture :*



# **THEORETICAL BASES OF EMULSIONS PREPARATION**

a lecture for English students of 3<sup>rd</sup> course  
in the speciality “Pharmacy” for foreign students

*Lecturer: associate professor Yuryeva A.B.*

# THE PLAN OF THE LECTURE

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1. Definition and characteristic of emulsions
2. Types of emulsions
3. Characteristic and classification of emulsifiers
4. Factors requiring on the stability of emulsions
5. Formulation of emulsions

## QUESTIONS FOR SELF-STUDY

1. Positive and negative properties of emulsions.
2. Assessment of the quality emulsions (the absence of mechanical inclusions, bundles, deviations in total mass);
3. Packing, conditions and prospects for the development of emulsions technology
4. Expansion of the assortment of emulsifiers;



# REFERENCES:

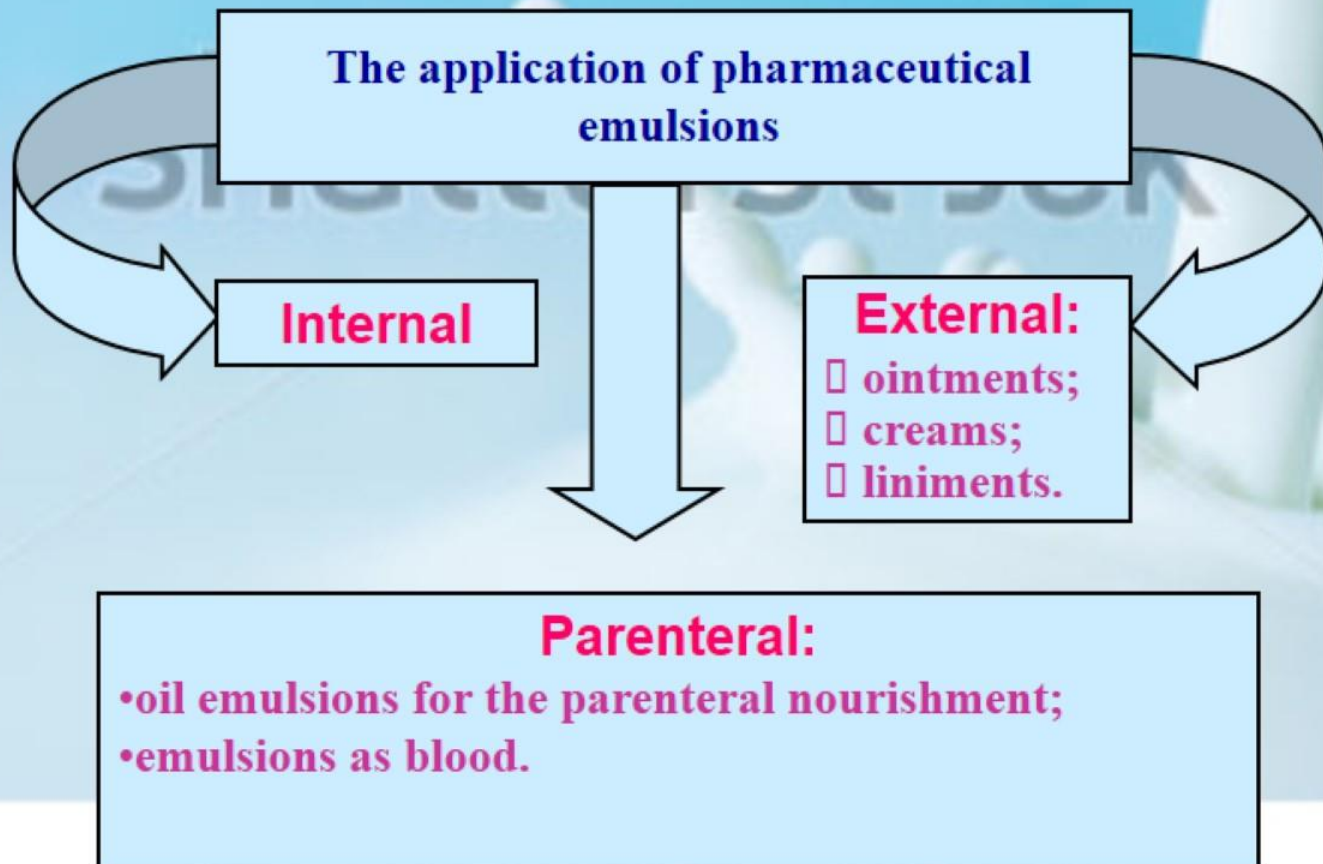
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3. **Dry, liquid and soft medicinal forms. A textbook for English students in speciality "Pharmacy" / A.I. Tikhonov, T.G. Yarnykh, A.B. Yuryeva, L.N. Podorozhna, S.S. Zuykina; Ed. by A.I. Tikhonov. – Kharkiv: NUPh; Original, 2011. – 208 p.**
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6. Tikhonov A.I., Yuryeva A.B., Zuykina S.S. **Chemist's technology of drugs. Infusions and decoctions. A lecture for English students of the 3-rd year, speciality "Pharmacy": a handbook for out-of-class work of students / Edited by acad. A.I. Tikhonov. - Kh.: PH of NUPh, 2009. – 28 p.**

# 1. Definition and characteristic of emulsions

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*Emulsions are homogeneous medicinal forms consisting of mutual insoluble thinly dispersive liquids, intended for internal, external application and also for injections*





## 2. Types of emulsions

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**Oil-water** (O/W) – direct, or I<sup>st</sup> type  
(*washed by water*)

1

**Water-oil** (W/O) – reverse, or II<sup>d</sup> type  
(*can not be removed by water*)

2

**Water-oil-water** (W/O/W)

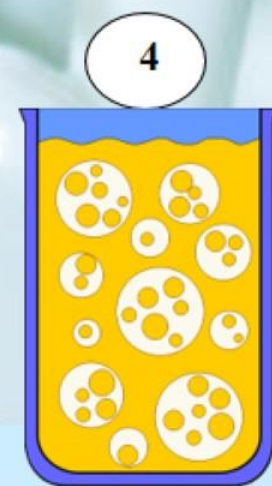
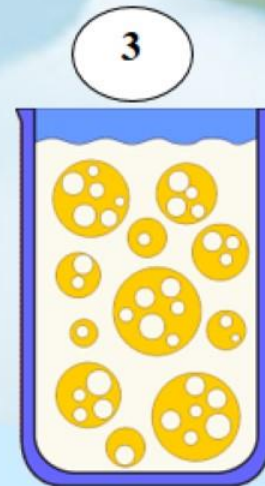
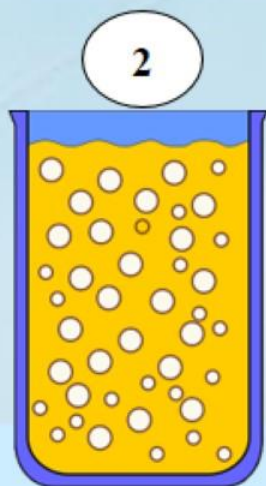
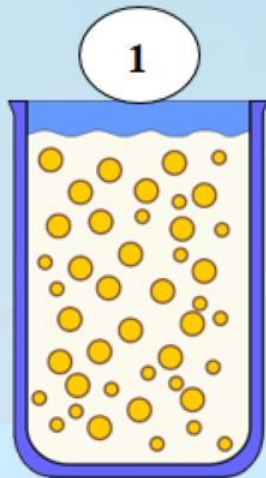
or

**Oil-water-oil** (O/W/O)

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4

mixed  
emulsions



# 2. Types of emulsions

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## TYPES OF EMULSIONS:-

**Oil-in-water emulsions (O/W)**



**Water-in-oil emulsion (W/O)**



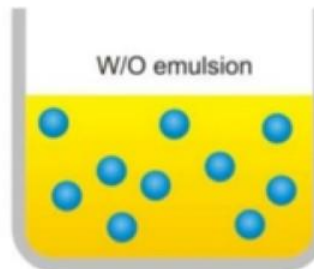
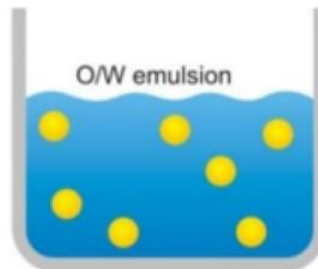
## EMULSION TYPES:

### OIL-IN-WATER EMULSION:

- Oil phase dispersed in water

### WATER-IN-OIL EMULSION:

- Water phase dispersed in oil



● Oil

● Water



## 2. Types of emulsions

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Methods of definition of emulsions type

→ **Method of dilution**

→ **Method of colouring**

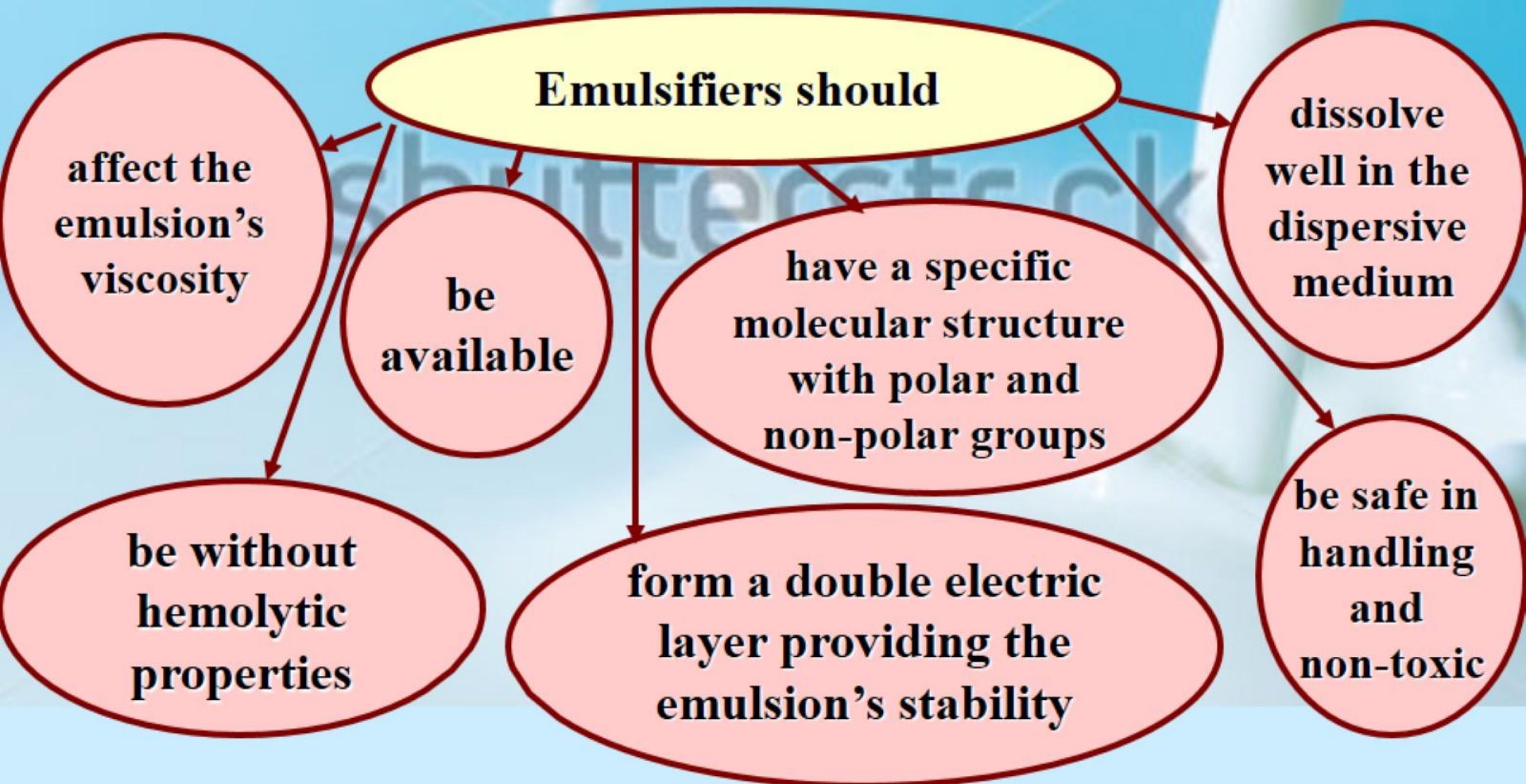
→ **Conductometric method**

→ **Method of the paraffin plate**

### 3. Characteristic and classification of emulsifiers

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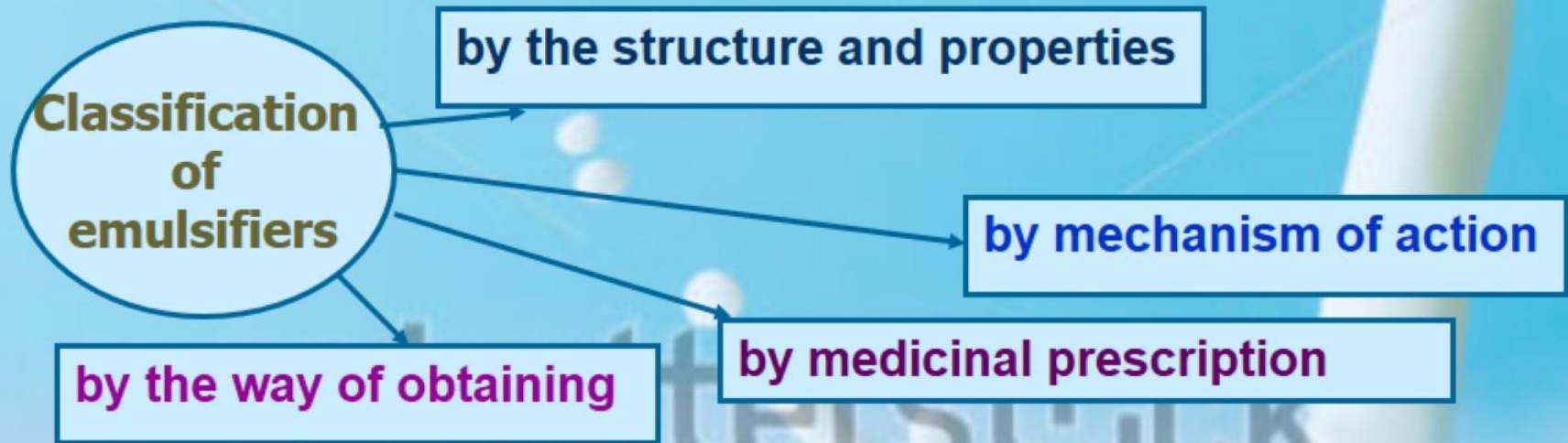
***Emulsifiers are diphilic SAS, which are distributed directly on the interface of two liquids***



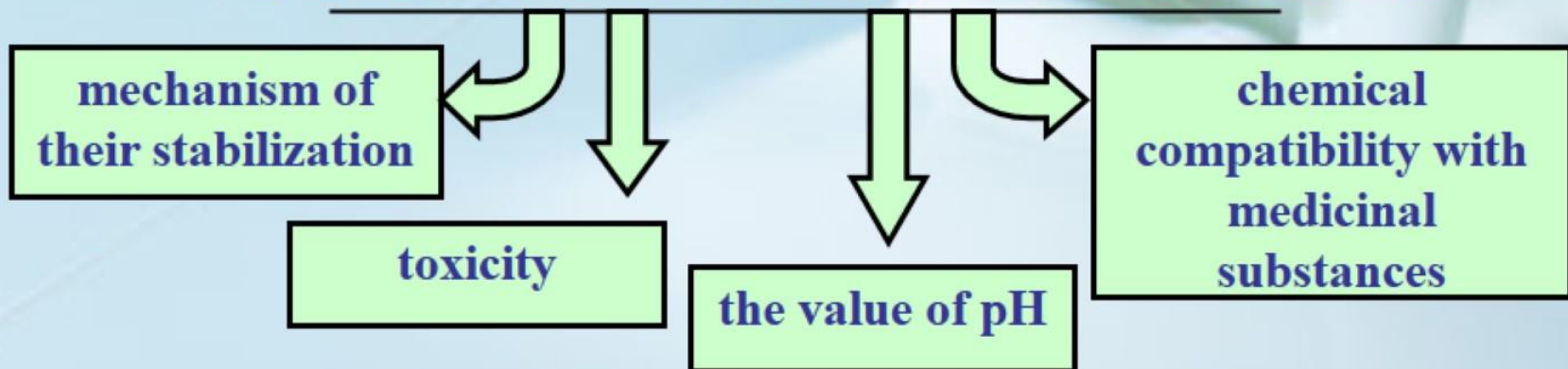


# 3. Characteristic and classification of emulsifiers

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**When choose of emulsifiers are take into account:**

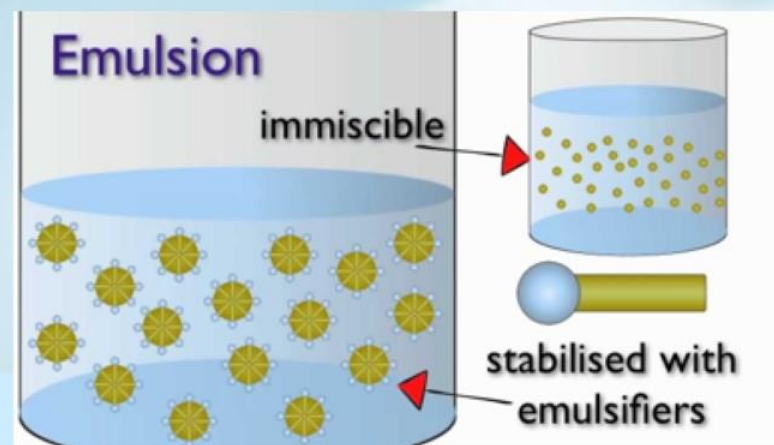


# 3. Characteristic and classification of emulsifiers

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## Mechanism of the stabilize action of emulsifiers

Emulsifiers adsorbing on the interface of the phases, decrease the surface tension and are accumulated on the surface interface, and mainly enveloping drops of the dispersed substance they form the adsorption film – the main factor of the emulsions stabilization





### 3. Characteristic and classification of emulsifiers

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*The type of the emulsion formed* depends on solubility of an emulsifier in the phase. The phase, in which the emulsifier is mainly dissolved, becomes the **dispersion medium**.

To obtain stable emulsions of the following emulsifiers are used:

O/W type

W/O type

hydrophilic emulsifiers (with HLB of 8-18)	lipophilic emulsifiers (with HLB of 3-6)
<ul style="list-style-type: none"><li>– <b>gum resins,</b></li><li>– <b>proteins,</b></li><li>– <b>alkaline soaps,</b></li><li>– <b>mucilages,</b></li><li>– <b>pectins, etc.</b></li></ul>	<ul style="list-style-type: none"><li>– <b>lanolin,</b></li><li>– <b>derivatives of cholesterol,</b></li><li>– <b>phytosterin,</b></li><li>– <b>pentol,</b></li><li>– <b>emulsifier T-2, etc.</b></li></ul>

# 3. Characteristic and classification of emulsifiers 12

It is possible to judge about the surface-active properties of emulsifiers according to the value of *hydrophilic and lipophilic balance (HLB)*.

***HLB – is the ratio between hydrophilic and hydrophobic groups in a molecule, its value is expressed by a definite number.***

(in practice the HLB scale from 0 to 20 is used)

HLB value	The area of SAS application	HLB value	The area of SAS application
1.5-3.0	foam extinguishers	8.0-18.0	emulsifiers of O/W type
3.0-6.0	emulsifiers of W/O type	13.0-15.0	foaming agents
7.0-9.0	wetting agents	15.0-18.0	solubilizers



# 5. Formulation of emulsions

## The structure of emulsion

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**Primary emulsion (PE)**

(it is a base of emulsion)

+

**Water for diluting**

**Emulsifier + Oil + Water (oleosole)**

**or**

**Emulsifier + Water + Oil (hydrosol)**



**The preparation is carrying out in a mortar**



**+ A base is dilutes by water**

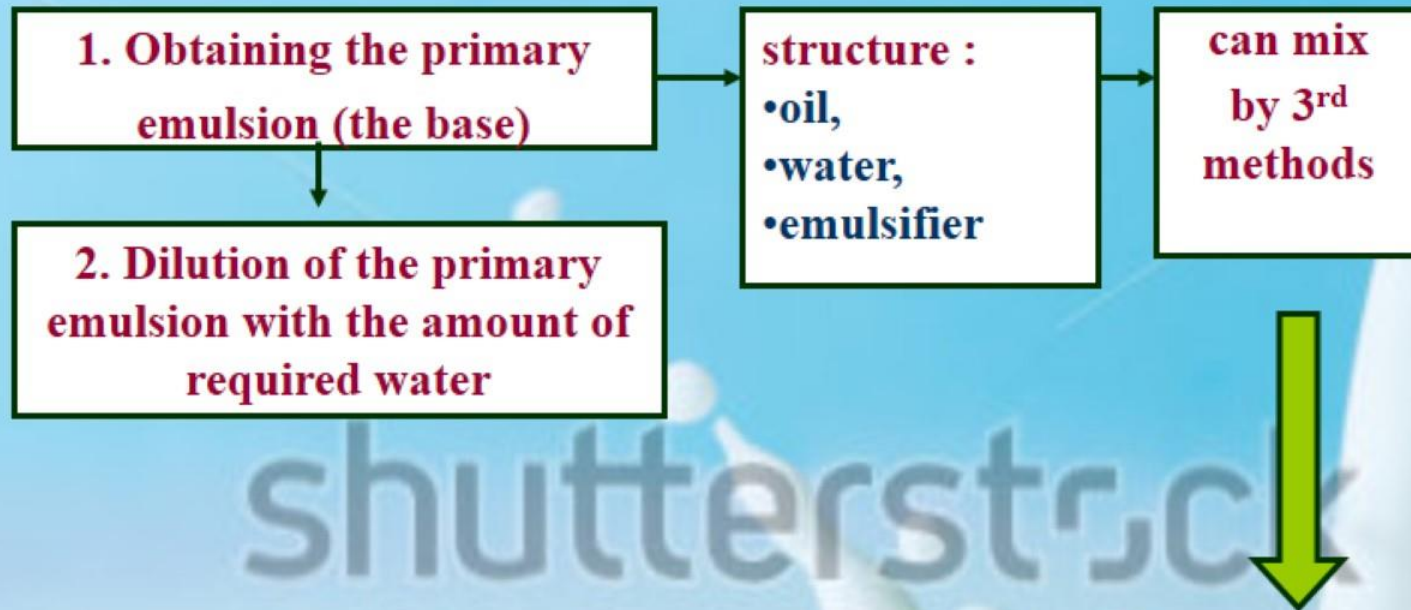


*Prepared emulsion*



# 5. Formulation of emulsions

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## Methods of formulation of primary emulsions

The method of formulation	The order of mixing substances
<i>Continental</i> (of <i>Bodrimon</i> )	(emulsifier + oil) + water
<i>English</i>	(emulsifier + water) + oil
<i>Russian</i>	emulsifier + (water+ oil)



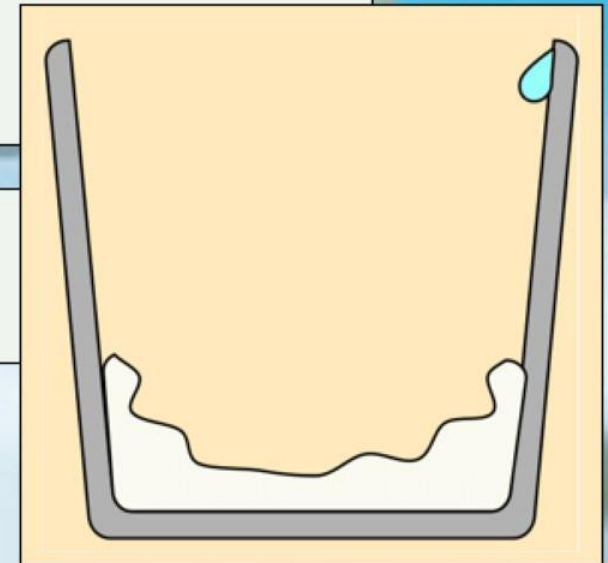
# 5. Formulation of emulsions

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## Determination of the primary emulsion's readiness

a mixture acquires the form of the sour cream-like mass, when a drop of water is put on the mortar's wall, it leaves a white trace

by the characteristic crackling



# Conclusions

- 1. Definition and characteristic of emulsions has been generalized.**
- 2. Types of emulsions has been studied.**
- 3. Characteristic and classification of emulsifiers has been reviewed.**
- 4. Factors requiring on the stability of emulsions has been analyzed.**
- 5. Formulation of emulsions has been considered and fixed on examples.**





**Thank you for  
attention!**