



Topic: INSTRUMENTS AND DEVICES FOR PUNCTURES, INJECTIONS, TRANSFUSIONS AND SUCTIONS

The objective: To study assortment and classification of instruments and devices for punctures, injections, transfusions and suctions. To carry out their inspection analysis and acceptance procedures using reference documentation.

Basic concepts and terms which should be acquired by students during their training and studying

Injection needles, medical syringes, complete devices for suction, infusion and transfusion.

Questions for self- training

1. Application of instruments and devices for punctures, injections, transfusions and suctions.
2. Classification of multi-use and single-use medical injection syringes.
3. The main technical requirements showed to multi-use and single-use medical injection syringes.
4. Symbols of multi-use and single-use medical injection syringes and their capacity.
5. Assortment and package of multi-use and single-use injection needles.
6. Materials used for manufacturing of multi-use and single-use medical injection syringes and needles.
7. The main technical requirements showed to multi-use and single-use injection needles.
8. Labelling of multi-use and single-use medical injection syringes.
9. Labelling of multi-use and single-use injection needles.
10. Packing, storage and transportation of multi-use and single-use medical injection syringes and needles.

Methodical maintenance of the class

1. Normative documents:
 - 1.1.GOST 22967-90. Multi-use medical injection syringes. General technical requirements and test methods.
 - 1.2.GOST 24861-91. Single-use medical injection syringes.
 - 1.3.GOST 25377-82. Multi-use injection needles. Specifications.
 - 1.4.GOST 25046-81. Single-use injection needles. The basic sizes, technical requirements. Test methods.
 - 1.5.GOST 25047-87. Complete single-use devices for suction, infusion and transfusion. Specifications.
 - 1.6.GOST 25725-89. Medical instruments. Terms and definitions.



2. Assortment of instruments for punctures and injections:
 - 2.1. Syringes of various types.
 - 2.2. Device for hemotransfusion, blood substitutes, infusion solutions.
 - 2.3. Tip of “butterfly” type to device for hemotransfusion, blood substitutes, infusion solutions.
 - 2.4. Trocar with tubes of polymeric materials.
 - 2.5. Needles of various types.
 - 2.6. Case for syringe and needles.

Task N 1

In a chemist's warehouse multi-use medical injection syringes have arrived. Carry out inspection analysis of the given goods and make a conclusion about opportunity of their acceptance.

Write down results into table 1 by the sample below.

Table 1

Results of inspection analysis of _____
(name of the goods)

Name of parameter	Characteristics	
	according to requirements of RD	of the goods inspected
The name and symbol		
Types of the goods		
Package		
Marking		
Technical requirements		
Conditions of storage		

The conclusion:

Working technique

Using GOST 22967-90. «Multi-use medical injection syringes. General technical requirements and test methods» sections 1, 2, 3, 6, we take necessary information and write down into the table. To determine type of the goods we use the Annex 8.1.

In the beginning we carry out visual inspection of products. We pay attention to integrity, quality of covering, distinct graduation, completeness, transparency of glass, absence of inclusions, scratches, etc.



We check presence and correctness of marking, packing. We determine proper conditions of storage for the goods.

Task N 2

In a chemist's warehouse single-use medical injection syringes have arrived. Carry out inspection analysis of the given goods and make a conclusion about opportunity of their acceptance.

Write down results into table 2 by the sample below.

Working technique

To perform the given task it is necessary to use GOST 24861-91 «Single-use medical injection syringes».

Table 2

Results of inspection analysis of _____
(name of the goods)

Name of parameter	Characteristics	
	according to requirements of RD	of the goods inspected
Rated capacity of a syringe		
Scaling of a syringe		
Package		
Marking		
Technical requirements		
Conditions of storage		

The conclusion: _____

Task N 3

From a shop "Medical apparatus" into a drugstore single-use injection needles have arrived. Carry out inspection analysis and make a conclusion about acceptance of the given goods.

Write down the results of inspection into table 3.

Working technique

It is necessary to find the corresponding normative documentation for single-use injection needles and to make a conclusion about quality of the goods.



Table 3

Results of inspection analysis of _____

(name of the goods)

Name of parameter	Characteristics	
	according to requirements of RD	of the goods inspected
The name of needles and their symbol		
Package		
Marking		
Technical requirements		
Conditions of storage		

The

conclusion:

Task N 4

In a drugstore of medical establishment suction, infusion, single-use transfusion complete devices have arrived. Carry out inspection analysis of the arrived goods.

Write down the results of inspection into table 4 by the sample below.

Working technique

The given task is made according to requirements of GOST 25047-87 «Complete suction, infusion and transfusion single-use devices. Specifications».

Table 4

Results of inspection analysis of _____

(name of the goods)

Name of parameter	Characteristics	
	according to requirements of RD	of the goods inspected
Completeness		
Package		
Marking		
Technical requirements		
Conditions of storage		

The

conclusion:



ANNEX 8

8.1. General information

Instruments for injections, infusions and transfusions are intended for dosed introduction of liquid drugs into tissues of an organism, for suction of exudates and other liquids, for cavity lavage and taking of tissue pieces. Such instruments include medical injection syringes, tubular needles, trocars, complete suction, infusion and transfusion devices, needleless injection device.

Syringe is manual piston-type pump consisting of scaled cylinder providing precise dose of a drug, a piston and fittings.

Depending on turnover type and field of application injection syringes and needles are divided into single- and multi-use.

Depending on quantity of syringe components two-component and three-component syringes are produced. Two-component syringe doesn't have piston cup.

By shape of connecting cone two types of syringes are available: Record type with conicity 10:100 and Luer type with conicity 6:100.

Now Luer type syringes are mainly used.

Syringes are characterized **by function**:

- for general purpose;
- for tuberculin (*T*);
- for insulin (*I*);
- for special purpose (veterinary, stomatologic, for washing cavities – evacuating syringes, irrigating syringes; gynecologic, with the metal cylinder and with additional devices).

By character of connection of the basic syringe details:

- sectional (M);
- non-sectional.

By location of a tip:

- concentric tip syringes (A);
- eccentric tip syringes (B).

By design:

- metal-glass type (type 1);
- glass type (type 2);
- plastic type.

By material:

glass syringe;
plastic syringe.

Glass syringes are used mainly in hospitals, laboratories and industrial applications. The pure properties of glass ensure that testing and clinical

procedures can be performed with confidence, without risk of allergic reactions or chemical interactions that can be associated with plastic syringes.

The three basic tip styles available all conform to the ISO 594 standard for Luer taper fittings and allow the practitioner to choose the best syringe type for their specific application.



Fig. 8.1. Three types of Luer syringes depending on tip styles.

Metal Luer Lock Tips are made of chrome-plated brass. They are fitted to heavy glass bases to assure greater strength than glass luer tips. All luer needles lock into Needle Lock Tips with an easy twist.

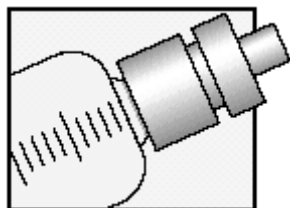


Fig. 8.2. Metal Luer lock tip.

Metal Luer Slip Tips embody all the same features as Metal Luer Lock Tips, except for the unique special locking device. These Metal Tips are chrome-plated brass and fit all luer needles and other female luer fittings.

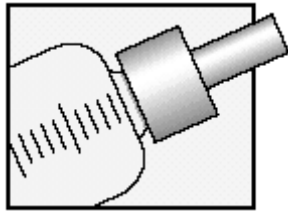


Fig. 8.3. Metal luer slip tip.

All Glass Luer Slip Tips have reinforced glass bases to assure strong tips and minimize breakage. They have beveled ends to reduce chipping.

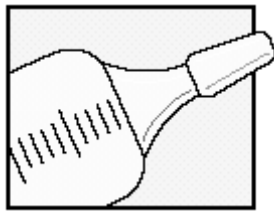


Fig. 8.4. Glass luer slip tip.

Packaging: Individually Boxed.

Tuberculin syringes.

Tuberculin Syringes are widely used in both clinical and research procedures for the administration of precise low-volume doses ranging from $\frac{1}{4}$ ml to 2 cc. Fabricated of chemically resistant borosilicate glass with easy-to-read accurate permanent calibration lines. The 1cc syringe is fitted with a white or blue plunger with standard graduations as illustrated below.

Packaging: Individually Boxed. 12 per Carton.

Size	Graduations
1/4 ml	.25ml in 0.01ml (1/100cc)
1/2 ml	.50ml in 0.01ml (1/100cc)
1 ml	1.00ml in 0.01ml, Lock Tip, Metal Plunger with O Ring
2 ml	2ml in 0.05 ml
1 cc	1:100cc and 16 min. in 1/2 min. divisions 1:100cc and 16 min. in 1/2 min. divisions, Blue Plunger 1:100cc – Reverse Scale, Blue Plunger 1:100cc and 16 min. in 1/2 min. divisions, Lock Tip 1:100cc and 16 min. in 1/2 min. divisions, Lock Tip, Blue Plunger
2 cc	1:40cc and 32 min. in 1/2 min. divisions 1:40cc and 32 min. in 1/2 min. divisions, Lock Tip

Evacuating syringes.

The Evacuating Syringe is useful in the irrigation of the bladder and urethra, gastric sampling and inflation of Foley catheters during cystoscopy. It is also suitable for use in irrigating catheters, intubation tube and for blood clot evacuation. Fitted with a knurled nickel-plated, removable adapter. Tip of syringe fits all standard cystoscopes.



Fig. 8.6. Evacuating syringe.

Packaging: Individually Boxed.

Eccentric tip syringes

Eccentric Tip Syringes (Off-center Tip) are designed for use in procedures where the needle is to be introduced as closely parallel to the injection area as possible. They are available in sizes from 5cc to 50cc in a choice of glass or metal luer lock tips, all individually boxed.

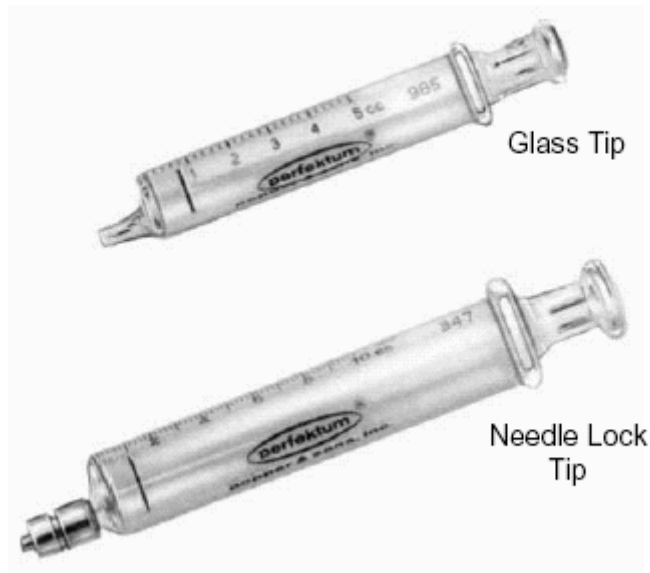


Fig. 8.7. Eccentric tip syringes.

Irrigating syringes.

Irrigating Syringes are made of heat resistant annealed glass. These syringes are fitted with age-resistant rubber bulbs which assure excellent service and repeated sterilizations for extended periods. The 1/2 oz. size is used for injecting, duodenal testing, moistening of dressings, ear, bladder and wound treatment, in addition to irrigating and aspirating. Also used with the Carrel-Dakin technique.



Fig. 8.8. Irrigating syringes.

Jumbo syringes (For Biomedical, Environmental, Laboratory, Clinical, Research and Industrial Procedures)

Available in various sizes, these syringes feature large effluent chrome plated metal Luer lock tips or glass Luer slip tips.



Features:

- Precision Made
- Durable Fully Annealed Glass
- Chemically Resistant Glass

Fig. 8.9. Jumbo syringes.

Metal parts of syringes are produced of corrosive-proof materials or brass with protective galvanic covering (nickelized or chrome-plated), glass ones – of colorless chemically and thermally proof glass having water resistance grade not less than 2nd. Calibration scale is rendered onto a syringe with mineral paint which diffuses into glass and become indelible during disinfection and sterilization of a syringe. The graduating mark for basic and intermediate value can be: 0,020; 0,025; 0,050; 0,100; 0,100; 0,500; 1,000; 2,000; 5,000; 10,000 ml. General purpose syringes are produced with capacity of 1, 1,5, 2, 5, 10, 20, 50 and 100 ml, for tuberculin – 1 ml, for insulin – 1, 2 and 5 ml. The latter two (2 and 5 ml in capacity) have an additional scale in activity units of insulin. 1 ml syringes are produced mountable and three-part (a cylinder, a piston, sealing ring), 2, 5, 10 ml ones – two-part (a cylinder, a piston). Also 1, 10, 50, 300 μ l microsyringes are available.

Marking of a syringe includes: name of syringe, rated volume, type, kind of a connecting cone, version, kind of connection (in case of mountable syringe), version of a piston, design features and purpose according to the normative documentation for syringes of a certain type (for example, *Multi-use injection*



syringe 10-1-10:100-3-A Cк Specifications 64-1-863-80 means 10 ml metal-glass (type 1) Record-type (10:100) syringe with a piston of the 3rd version, concentric tip (A) and silicon ring (Cк).

The main **technical requirements** showed to syringes are the following:

- transparency of syringe cylinder wetted with water in order to provide visibility of drugs to be injected;
- moving of a piston in a cylinder should be smooth and even;
- surface of metal parts of syringes should be free from nicks, dents, scratches, cracks, bubbles and other defects which break integrity of galvanic covering;
- joint tightness of glass cylinder with a tip and of piston with a cylinder;
- marks and digits of a scale should be distinct and resistant against erasing;
- resistance against mechanical influences at transportation and repeated disinfection processing by boiling, presterilizing cleaning and hot-air sterilization.

Shelf-life of multi-use syringes is not less than 1 year.

Single-use syringes are made of certain grades of polypropylene, polystyrene and copolymer of styrene and acrylonitrile, allowed for medical application by authorized bodies of public health services. For manufacturing of a piston in three-component single-use syringes superfine natural rubber or silicon rubber with polydimethylsiloxane surface covering are used.

Syringe capacities are 1, 2, 5, 10, 20, 30, 50 and 150 ml.

Additional technical requirements include:

- apyrogenic properties;
- sterility of syringes.

Marking of a syringe includes: name, rated capacity in ml, type of connecting cone (A – with concentric cone, B – with eccentric cone), version and designation of the standard for given syringe (for example, *Single-use injection syringe 5A "Luer" GOST 24861-91*).

Each syringe is tightly packed into polymeric retail package (fig. 8.10) marked with the following: description of contents; inscriptions “STERILE”, “NON-PYROGENIC”, “FOR SINGLE USE ONLY”; name and/or trademark of enterprise - manufacturer or supplier; batch number or manufacturing date; “EXPIRY DATE” (month and year); additional inscriptions.

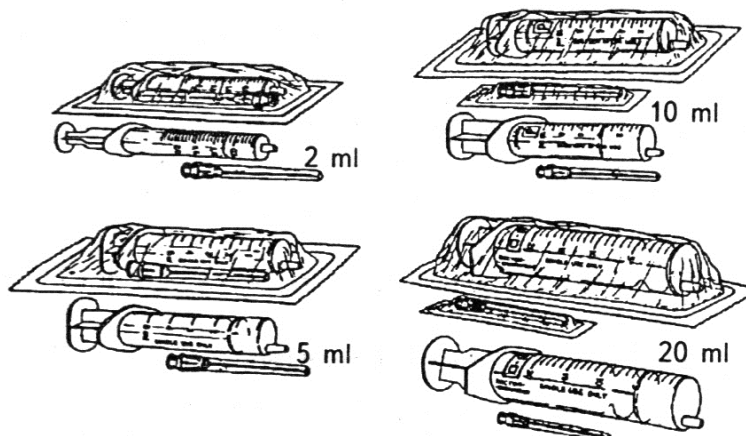


Fig. 8.10. Sterile package of single-use plastic syringes.

Sterilization is carried out with gas (ethylene oxide) or radiation. Period of storage within non-broken packages – up to 5 years.

There are special syringes intended for injection of liquids into cavities of larynx, uterus, for lavage of tooth pulp cavity, etc. They are equipped with demountable tips and cannulas. Syringes for injection of radiopaque substances are also attributed to special syringes. Irrigation syringes for cavities differ from injection ones by the greater capacity and presence of a ring on rod end for big finger (for example, Janet's syringe).

For injection of drugs and antidotes for urgent medical aid, self-help and mutual aid *syringe – tube* is used, and for anesthesia in dentistry and for mass vaccination needleless injection device is used.

A syringe - tube is a single-use injection syringe, filled with a drug. It consists of elastic polymeric body (ampoule) which mouth contains preliminary inserted sterilized steel needle, hermetically sealed with polymeric cap.

Tubular Needles

Tubular needles is a tube having one end sharpened for penetration into tissues and another end with a head (cannula) corresponding by its cone to those of a syringe. A head has 2 or 4 flats for holding of a needle and putting onto handpiece of a syringe. A mandrin can be inserted into a needle tube for cleaning a canal.

Tubular needles are divided into injection needles, puncture biopsy needles, needles for infusion and transfusion, needles for contrast radiography, auxiliary needles.

Depending on angle of sharpening needles are produced with long, average, short bevels and blunt ones (fig. 8.11).

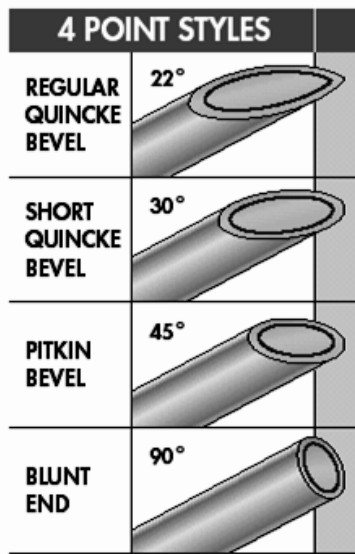


Fig. 8.11. Bevel types of tubular needles

Depending on mode of their turnover injection needles are made for single use (disposable) and for repeated use.

All needles (unless otherwise noted) are manufactured from Stainless Steel Tubing, conform to ISO 594, and ultrasonically cleaned. Needle hubs are either chrome or electroless nickel-plated.

Reusable needles are non-sterile when shipped. Needles may be sterilized using any conventional methodology.

Injection needles (fig. 8.12.) can be for normal and special purpose.

Normal injection needles are produced with heads of the following types: 1 – with conicity 6:100 (for Luer type syringes), 2 and 3 – with conicity 10:100 (for Record type syringes and glass syringes respectively). Their diameter varies from 0,4 to 2,5 mm and length from 6 to 150 mm.



Fig. 8.12. Injection needles

Marking of a needle includes: type of a needle (only for types 1 and 3), external diameter and length of a tube, version (for needles with average and short bevels), designation of a standard (for example, *injection needle 1 - 0,6x40 GOST 25377-93* – injection needle of type 1 for Luer type syringes with diameter 0,6 mm and length 40mm with long bevel).

Also special needles for intradermal, hypodermic, intramuscular, intravenous injections are available. They differ from normal ones either by their working part or head.



Packaging:

Individually Boxed - Overpacked
1 Dozen (12 Boxes) per Shelf Pack.

Biopsy needles

Cone Needle for Liver Biopsy

Has a blunt end chamfered to a sharp cutting edge and a matching closely fitted blunt end stylet.



Aspirating Trocar Needle

Has blunt tapered end and a contoured cap on the closely fitted stylet, which has a protruding trocar point.



Lung Biopsy Needle

A thin wall needle with female luer hub, sharp pointed cannula and a fitted stylet with matched beveled point. Used for needle aspiration biopsy of hilar and mediastinal masses.



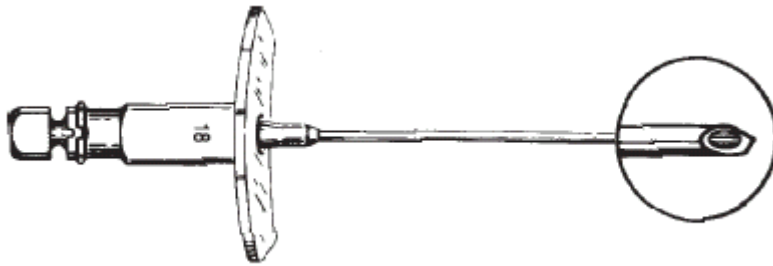
Chiba Type Needle

Extremely flexible thin wall outer cannula with matched stylet features short bevel with buffed heel.



Morrison Bone Biopsy Needle

Has a female luer lock hub attached to a gripping shield. Cannula has a medium bevel with unique feature of the right side of the bevel being slightly lower than the left. Fitted stylet has matched beveled point.



The basic technical requirements showed to needles are the following:

- corrosion- and acid-resistance;
- smooth surface of needles and mandrins;
- absence of scratches, cracks and other visible defects on surface of needles; absence of sharp edges and agnails on needle head and mandrin ends;
- mandrin should easily come into a needle canal;
- elasticity of a tube and efficiency of its joint with a head;
- resistance of needles to operation cycle.

Needles are packed into cardboard or plastic boxes or into blister package and then put into group container such as cardboard box.

On retail and group containers it should be specified: name of the ministry, name or trademark of manufacturer, name and symbol of needles (except for plastic and blister initial packing), number of needles, manufacturing date (month and year) only on group container, designation of the standard.

Single-use injection needles are produced of diameters from 0,4 to 1,2 mm and length from 10 to 50 mm. Color design of needle heads depends on tube diameter (for example, grey color for 0,4 mm needles, pink – for 1,2 mm ones, etc.). Tubes of single-use needles are produced of the same steel grades as for multi-use needles; a head is produced of low density polyethylene or polypropylene, allowed for use by authorized bodies of public health services. Single-use needles are manufactured sterile in polymeric packages.

Retail package should be tight and provide sterility, non-pyrogenity and non-toxicity of needles during 3 years, and also opportunity of visual inspection of head color. If non-transparent package is used it is painted according to color of needle head.

On retail package the following should be specified: symbol of a needle (the same as for multi-use needles), inscriptions “STERILE”, “NON-PYROGENIC”, batch number indicating month and year of sterilization, shelf-life. Needles are sterilized with gas or radiation.

Complete single-use devices for suction, infusions and transfusions are intended to withdraw blood from a donor, to inject solutions to recipient or for transfusion of blood, its components or blood substitutes from glass and polymeric containers. Depending on purpose devices are produced of the following types:



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suction, infusion, transfusion, transfusion-infusion. They consist of air pipe and infusion tubes, needles for puncture of a bottle plug or plastic container with blood and for vein puncture.

Elements of such devices are produced of nontoxic polymeric materials allowed for medical use: high density polyethylene (body and caps), polyvinylchloride (tubes). Devices are supplied sterile, in initial packing of low density polyethylene. Shelf-life is 3 years.