Mustafoev Z.M.

GENERAL ANATOMY OF THE MUSCULOSKELETAL SYSTEM

Study guide

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION OF THE REPUBLIC OF UZBEKISTAN

SAMARKAND STATE MEDICAL UNIVERSITY

Mustafoev Z.M.

GENERAL ANATOMY OF THE MUSCULOSKELETAL SYSTEM

A teaching aid for medical faculty students of medical universities

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AUTHORS:

Mustafoev Z.M. -Samarkand State Medical University, Department of Human Anatomy, PhD, Associate Professor.

REVIEWS:

Boymurodov R.R. -Bukhara State Medical Institute, Department of Anatomy, Clinical Anatomy, Associate Professor.

Mamataliyev A.R -Samarkand State Medical University, Department of Clinical Anatomy, Associate Professor

The teaching aid is prepared for the purpose of training and stimulating professional activity of personnel possessing such properties as solving promising problems, high universal and professional culture, creative and social activity, ability to independently achieve goals in social and political life. Preparation for the lesson is the development of a whole range of activities and at the same time selects such an educational process that ensures a positive result. The teaching aid on the subject of human anatomy reflects all aspects of private anatomy separately.

The teaching aid is of particular importance in improving the quality and effectiveness of classes, in developing the students' skills and abilities, and in developing a healthy lifestyle and medical culture in their regions.

In teaching the subject of human anatomy according to the modular program, special attention is paid to the application in the learning process of modern medical and pedagogical technologies, the patterns of the structure of organs and tissues of the body of a healthy person, taking into account the individual structure of the human body, depending on age, sexual characteristics, taking into account ontogenesis, topographic connections, congenital defects and anomalies, the influence of the external environment and work on the body.

We hope that this manual will serve to improve the educational process and provide direct practical support to teachers and students in mastering this subject.

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INTRODUCTION

Since the creation of this teaching aid, the task has been set - to conduct a high-quality educational process, further improve and develop nursing, train qualified specialists for our Republic, capable of working independently and being competitive. 09.23.2020 Republic of Uzbekistan. Law No. O'RQ-637 "On Education". (Adopted by the Legislative Chamber on 05.19.2020, approved by the Senate on 08.07.2020)

Resolution of the President of the Republic of Uzbekistan dated July 11, 2019 No. PQ-4391 "On measures to introduce new management principles into the system of higher and secondary specialized education."

In order to implement a unified state policy in the sphere of higher, secondary, and specialized vocational education aimed at a qualitative renewal of the educational process, training independently thinking, highly qualified personnel with modern knowledge and high moral and ethical qualities, measures are being taken to organize the educational process, introduce new pedagogical technologies and teaching methods in accordance with international practice, improve curricula and scientific programs, introduce modern forms of education and means of information and communication technologies.

Effective organization of research work in higher education institutions, widespread implementation of research results in practice, ensuring strong mutual integration of higher education, science and production, wide involvement of talented youth in research work and their comprehensive support.

Organization of a continuous system of training, retraining and advanced training of managers and teachers in higher and secondary specialized professional institutions, creation of conditions for regular improvement of the quality and level of their professional skills, training and internships in foreign countries.

In creating curricula and programs, the needs and proposals of employers, global experience, structural changes in the real sector of the economy, and high requirements for training specialists are taken into account.

This textbook is intended for students of medical faculty of medical universities and was created to facilitate the mastery of the anatomy of bones, joints and muscles. The textbook is prepared in accordance with the anatomy program, paying attention to the following issues:

Purpose and objective.

What should a student know on this topic?

What practical knowledge should a student have on this topic?

What important questions should a student be able to answer?

The authors recommend this textbook to students for independent study, use in practical lessons and believe that it will help them master these complex sections of anatomy.

The impetus for the creation of this teaching aid was the goal of enriching the information resource center with educational literature and alleviating specific difficulties in mastering the subject by students.

The opinions and discussions about this textbook have been positively received by the authors.

THE TEACHING OF BONES

TOPIC: The study of bones - Osteology. The structure of the skeleton, functions, structure and connection of the spine, bones of the chest. The skeleton of the body.

MODEL OF EDUCATIONAL TECHNOLOGY AND THEORETICAL TASKS

Topic No. __ Time 2 hours (80 minutes)	Number of students ___
Form and type of training	Tasks For receipt new theoretical knowledge
Lecture plan	1. Structure bones, types . 2. Vertebrate pillar, structure And connections cervical, thoracic vertebrae . 3. The structure and connection of the lumbar, sacral and coccygeal vertebrae . 4. Structure and connection of the bones of the chest. 5. Latin name for bones .
The purpose of the lesson is to develop students` knowledge on the topic of osteology – the study of bones.	
Tasks of the teacher: 1. Provides an idea of the structure, types and connections of bones. 2. Provides an idea of the structure of the spine, cervical and thoracic vertebrae. 3. Provides an idea of the structure and connection of the lumbar, sacral and coccygeal vertebrae . 4. Provides an idea of the structure and fusion of the bones of the chest. 5. Gives an idea of the Latin names of bones.	Results of educational activities: 1. You will gain an understanding of the structure and types of bones. 2. Gain an understanding of the structure and connection of the spine, cervical and thoracic vertebrae. 3. There will be an idea of the structure and connections of the lumbar, sacral, and coccygeal vertebrae. 4. Gain an understanding of the structure and connection of the bones of the chest. 5. They will have an idea of the Latin names of bones.
Teaching methods:	Question-answer, discussions, brainstorming, "Working with small groups" "Z.N.U", "Insert" "Cluster"

Forms of organization of educational activities:	Work in groups, collectively, individually
Learning tools:	Lecture texts, handouts, literature, stands.
Conditions of study:	Study room
Feedback methods and tools:	**Oral and written control, presentations, group work.**

TECHNOLOGICAL MAP OF THEORETICAL LESSON

No.	Stages of learning	Allotted time	Contents of the training	Educational methods and forms	Educational Supplies
1.	Organizational part	2 minutes	The students' uniform and preparation are checked classes . Duty officer provides information on student attendance classes.	Orally	Magazine, pen
2.	Introduction (Motivation)	3 minutes	Brief review of the material from the theoretical lesson on the topic. To interest students in the new topic and direct them to study it.	Orally	
3.	Description of the new topic	4 5 minutes	Objective: to develop students' knowledge on the topic and personal qualities through the lesson. Topic: Structure and connection of the bones of the shoulder girdle and free upper limb.	Brainstorming	Board, chalk, notepad, pen, sheet of paper with test questions.

			Plan 1. Structure and connection of the bones of the shoulder girdle; 2. Structure and connections of the bones of the free upper limb; 3. Structure and connection of the bones of the hand; 4. Latin name for bones.		
4.	Securing the material (Application)	25 minutes	Control questions are used to expand the level of students' knowledge, increase their ability to develop independent logic, and consolidate a new topic. Methods: "Working with small groups", "Z.N.U", " Insert» reinforces the new topic and activates students.	"Working with small groups", "Z.N.U", " Insert»	Sheets with control questions, test standards.
5.	Concluding part	5 minutes	The results of the lesson will be announced and the students will be assessed on a 5-point scale. Encourages students who actively participate in the lesson.	Discussion	Board, literature, pen, notebook.

			Homework is given at the end of the lesson. Topic: The structure and connection of the bones of the shoulder girdle and the free upper limb.		

Study assignments 5. Structure of the ribs and sternum.

Appendix 1.

Tasks for groups.

1 - group.

1. Features of the cervical vertebrae.
2. Create a cluster for the word "vertebra".

2 – group.

1. Features of the structure of the thoracic vertebrae.
2. Create a cluster for the word "torso bones".

3 - group.

1. Features of the lumbar vertebrae.
2. Create a cluster called “Types of bones”.

4 - group.

1. Explain the structure of the bones of the body.
2. Make a cluster from the word "Rib".

Evaluation criteria and indicators (points)

Group	1 task;	2 task;	Task 3; (each question 0.2 points)			Total points
	(1,0)	(1,4)	question 1	question 2	question 3	(3.0)
1						
2						
3						
4						

Z.N.U. Method

(To control the knowledge gained in lectures and theoretical classes.)

Handouts for testing knowledge using Z.N.U.'s methodology .

Concepts	I know “+”, I don’t know “-”	Found out “+”, Didn't recognize “-”.

Nomenclature:		
Bones of the body.		
Age characteristics.		
Structure of the cervical vertebrae.		
Structure of the thoracic vertebrae.		
Structure of the lumbar vertebrae.		
Structure of the sacral vertebrae.		
The structure of the coccygeal vertebrae.		
Describe the structure of 1-2 cervical vertebrae.		
Structure and connection of ribs.		
Structure of the sternum.		

Appendix 2.

" Insert Method "

Insert is an interactive system for effective learning and thinking that helps in independent study. In this case, the assignment on the topics of lectures, books and other materials is given to students in advance. After reading this, the student expresses his opinion using the signs "B; +; -; ?".

Text Markup System

" V " - confirms what I know.

"+" - new information.

"-" - contrary to what I know.

"?" - made me think. I need more information about this. Insert table.

Concepts	V	+	-	?
Classification of joints.				
Basic elements of the joint.				
Additional elements of the joint.				
Joint biomechanics.				
Junction of the I - II cervical vertebrae.				
The connection of the bones of the body.				
The junction of the sacrum and coccyx.				
The connection of the ribs with the vertebrae.				
The connection between the sacrum and the coccyx.				

Osteology is the science of bones

Bones of the skeleton

The part that forms the solid foundation of the body is the skeleton. Skeleton (skeletos) comes from the Greek word for "dried" and consists of more than 200 individual bones. The skeleton weighs 5-6 kg, it is 8.5% of the total body weight in women and 10% in men. The skeleton performs protective, support-motor and biological functions.

Sceletos - means "dried". An ancient method of preparing bones: drying in hot sand or under the sun. Bones develop from the middle germ layer - the mesoderm.

Skeleton function:

1. Protective function: groups of bones join together to form cavities. Organs are located in these cavities;

2. Motor function: the bones of individual parts of the skeleton are connected to form a joint, which is set in motion by muscles;

3. Support function: serves as a support for the human body and muscles;

4. Biological function: bones contain minerals such as phosphorus, calcium, iron and other substances;

5. Formed elements of the blood mature in the red bone marrow of the bone.

Name of bones:

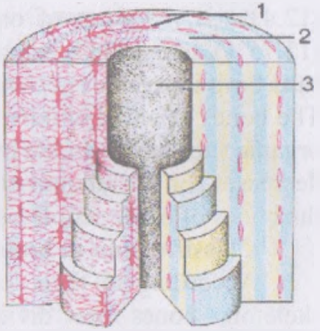
The part that serves as a support for the tubular bones is called the diaphysis. The end of the diaphysis that corresponds to the necks of the tubular bones is called the metaphysis. The articular ends of the tubular bones are called the epiphyseal part. The bone processes to which muscles are attached are called apophyses.

The morphological unit of bone is the osteon, a structure formed from bone tissue located inside the bone around channels (cavities) through which blood vessels and nerve fibers are directed. Osteons **(Fig. 1)** are located along the length in tubular bones and along the surface in flat bones.

Ossein is an organic substance of bones. Ossein is a type of collagen substance. Ossein and inorganic substances make bones hard, strong and elastic. When examining the friction of a bone on a cut, we see the formation of a dense substance on the outside and a porous substance on the inside.

The dense substance is well developed in the areas of the bone body (diaphysis), and the porous substance is in the bone ends of the bones (epiphyses). Bone marrow is located in the porous part of the bones, and in turn, two types of bone marrow are distinguished. Red bone marrow is the area of development of formed blood cells. Yellow bone marrow consists of fat cells.

So, the bones are composed of bone substance; periosteum, bone marrow, articular surfaces, blood vessels and nerves.



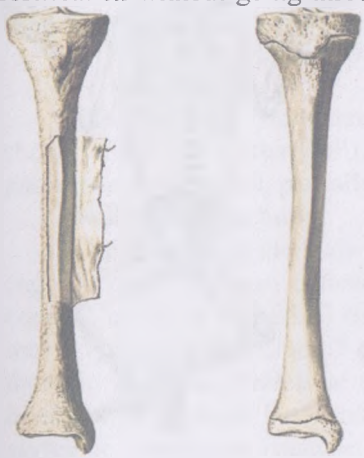
(Fig.1) Osteon structure
1. bone cells
2. osteon layer
3. osteon canal

During ontogenesis, the bones of the skeleton undergo 3 different states:

1) the condition of the connective tissue;

2) condition of cartilage;

3) the state of ossification. Most of the bones that make up the skeleton go through the above 3 states, and some bones (the bones that make up the cranial vault and facial bones, the clavicle) go from the state of connective tissue to the state of ossification without going through the state of cartilage, such bones are called primary bones. Secondary bones go through three stages of development (the state of connective tissue, the state of cartilage, the state of ossification).



In the early stages of embryonic development, the skeleton consists of connective tissue. At the next stage of its development, connective tissue is replaced by cartilage. Ossification points appear in the embryo from the 2nd month of development. These ossification points are formed at the ends of the bone body (in the metaphyseal region) and in the middle part

of the bone (in the diaphyseal region). Such ossification points are called primary ossification points. In the last months of embryonic development or the first years after birth, secondary ossification points are formed: at the articular ends of the bones (epiphyseal part).

On the outer surface of the bones there is a periosteum through which blood vessels and nerves pass. Bones are 50% water. The remaining part (12.4%) is made up of organic substances, as well as fatty substances (15.75%), inorganic substances (21.85%). Calcium, phosphorus and carbon salts form inorganic substances of bones, and ossein is an organic substance. The bones of small children are flexible due to a slightly larger amount of organic substances. In the bones of adults, the amount of organic substances decreases and the amount of inorganic substances increases. Because of this, the bones of older people become more fragile.

Classification of bones.

According to their location in the skeleton, bones are divided into the following groups:

1. Bones of the trunk: vertebrae, sternum, ribs.

2. Bones of the cranium and bones of the facial skull: temporal, parietal, frontal, occipital, ethmoid bone, upper and lower jaw.

3. Bones of the shoulder girdle: clavicle and scapula.

4. Bones of the free upper limb: bones of the shoulder, forearm and hand.

5. Pelvic girdle and free bones of the lower limb: femur, tibia and fibula, bones of the foot.

Bones are divided into 4 groups depending on their shape, function and development.

I. Tubular bones: are divided into short and long. Their structure is tubular

and consists of a dense solid substance on the outside and a porous substance on the inside. These bones act as protection, support and movement.

Long tubular bones (humerus, ulna, carpus, femur, tibia, femur) have a diaphyseal part and 2 endochondrial ossifying epiphyseal parts (called biepiphyseal bones).

Endochondral ossification in short tubular bones (palms and phalanges of the fingers) occurs in one epiphysis (the so-called monoepiphyseal bones).

II. Porous bones.

These bones have a porous substance inside and are covered with a thin, dense (compact) substance on the outside.

1. The ribs and sternum belong to the group of long spongy bones.

2. Vertebrae and metacarpal bones belong to the group of short porous bones.

III. Flat bones.

a) The flat bones of the skull perform a predominantly protective function. The bones are ossified from the state of connective tissue, their inner and outer surfaces consist of a dense substance (compact), and in the middle there is a porous substance - diploe.

b) The pelvic bone and the scapula form a group of flat bones.

IV. Mixed bones.

This group of bones develops from several parts and is connected (bones of the base of the skull). The group of mixed bones also includes the partially endochondral, partially endesmally developed vertebral bone.

Skeleton of the body

The skeleton of the body consists of the vertebral column and the rib cage. Vertebral column *columna vertebralis* **(Fig. 2)** ***The spinal column*** consists of 33-34 individual structures called vertebrae, which are divided into 5 types. These include 7 cervical vertebrae *(vertebrae cervicales),* 12 thoracic vertebrae *(vertebrae thoracicae*), 5 lumbar vertebrae *(vertebrae lumbales*), 5 sacral vertebrae *(vertebrae sacrales),* and 1-3 coccygeal vertebrae *(vertebrae coccygeae*). The spinal column has four curves:

cervical, thoracic, lumbar, and sacral. The forward curve in the cervical and lumbar regions is called **lordosis,** and the backward curve in the thoracic and sacral regions is called **kyphosis** . These four curves are normally present in healthy people. Some medical conditions can cause lateral curves known as **scoliosis,** usually affecting the thoracic vertebrae and often caused by poor posture while writing or by occupational factors.

Features of the vertebrae

Features of the cervical vertebrae:

1. there are openings on the transverse processes
2. horizontally oriented upper and lower articular surfaces.
3. spinous processes are bifurcated from the 2nd to the 6th cervical vertebrae

Features of the thoracic vertebrae:

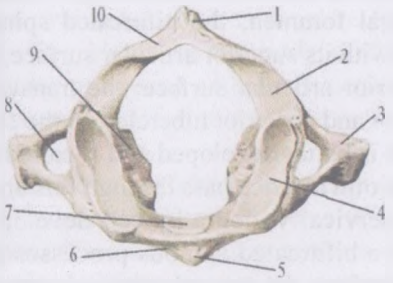
1. The thoracic vertebrae have frontally oriented upper and lower articular surfaces
2. there are costal dimples on the transverse processes and body of the thoracic vertebra

Features of the lumbar vertebrae:

1. The lumbar vertebrae have sagittally oriented upper and lower articular surfaces
2. additional processes at the bottom of their transverse processes.

The first cervical vertebra is the atlas.

The cervical spine consists of 7 vertebrae, with the first and second vertebrae being different from the others. On the first **(Fig. 3)** The cervical vertebra lacks articular processes, a vertebral body, and a spinous process. On the anterior arch, the anterior tubercle is located on the outside, and the odontoid fossa is located on the inside. On the posterior arch, the posterior tubercle is located on the outside. The upper surfaces of the articular processes are connected with the condyles of the occipital bone . The lower articular surfaces form a connection with the second cervical vertebra.

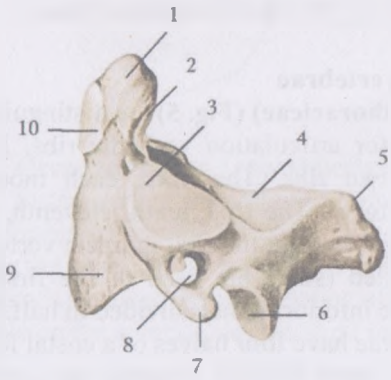


(Fig.3) 1 - neck vertebra
1- anterior tubercle
2- sulcus vertebralis
3-transverse processes
superior articular surfaces
5- posterior tubercle
6- anterior arch
7- tooth socket
8- hole transverse process
9- lateral mass
10- bow posterior

Second cervical vertebra - axis

The second cervical vertebra **(Fig. 4)** is distinguished by the presence of a tooth. On the back surface of the tooth there is a posterior articular surface, and on the front surface there is an anterior articular surface.

The tooth has a transition zone into the vertebral body, an apex, and a base. The second cervical vertebra has the following formations characteristic of other cervical vertebrae: a spinous process, a transverse process, an opening on the transverse process, a vertebral body, a vertebral arch, a lower articular process, which has a lower articular surface. On the upper surface of this vertebra is the upper articular surface, which connects with the first cervical vertebra.

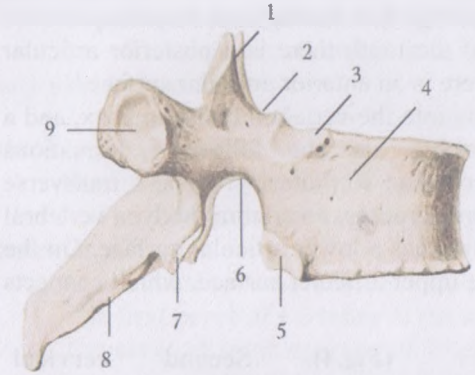


(Fig.4). Second cervical vertebra
1- tooth
2- posterior articular facet
3- articular facet higher
4- lamina of the vertebral arch
5- spinous process
inferior articular process
7- transverse processes
8- for . Transversarium
9- vertebral body
10- anterior articular facet

3-7 – cervical vertebrae - cervical vertebrae

The 3rd through 7th cervical vertebrae contain the following elements: the body of the vertebra; the vertebral foramen; the bifurcated spinous process; the superior articular process with its superior articular surface; the inferior articular process with its inferior articular surface; the transverse process with its foramen and the anterior and posterior tubercles. In the sixth cervical vertebra, the anterior tubercle is better developed and is called the carotid tubercle (since the common carotid arteries pass through this area). The spinous process of the seventh cervical vertebra is well developed, while all other cervical vertebrae have bifurcated spinous processes and are not palpable through the skin. Therefore, the seventh cervical vertebra is called the protruding vertebra.

Thoracic vertebrae - vertebrae thoracicae



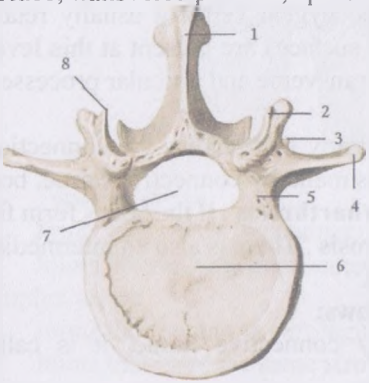
(Fig.5) **Thoracic vertebra**
1- superior articular process
2- vertebral notch
3- superior costal fossa
4- vertebral body
5- inferior costal fossa
6- inferior vertebral notch
7- inferior articular process
8- spinous process
9- transverse costal fossa

Lumbar vertebrae - lumbar vertebrae

Thoracic vertebrae **(vertebrae thoracicae) (Fig. 5)** are distinguished by the presence of a costal fossa for articulation with the ribs. Each thoracic vertebra articulates with two ribs. Therefore, each thoracic vertebra has two halves of a costal fossa. The first, tenth, eleventh, and twelfth thoracic vertebrae are distinguished. In the first thoracic vertebra, the superior fossa is completely filled (since the head of the first rib articulates with this vertebra), and the inferior fossa is divided in half. The second through ninth thoracic vertebrae have four halves of a costal fossa, which articulate with two ribs. The tenth thoracic vertebra has only an superior costal fossa, since this vertebra articulates only with the tenth rib.

The eleventh and twelfth thoracic vertebrae have a fully developed costal fossa, which is called a complete fossa. The thoracic vertebrae have the following elements: the body of the vertebra; the pedicle; the superior articular processes with the superior articular surfaces; inferior articular processes and inferior articular surfaces; costal fossae; transverse process; spinous process.

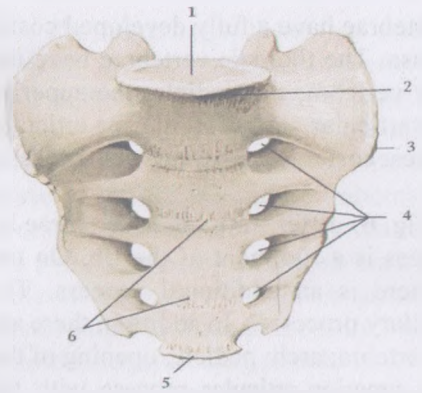
Lumbar **vertebrae lumbales** (Fig. 6) differ from other vertebrae by their large size. The transverse process is a rudiment of the rib. On the posterior surface of this process there is an additional process. The superior articular process has mammillary processes. In addition, there are the following elements: body of the vertebra; arch; pedicle; opening of the vertebra; lower articular surfaces ; superior articular process with the superior articular surface; inferior articular process with the inferior articular surface; transverse process; spinous process.



(Fig.5) Thoracic vertebra
1- superior articular process
2- vertebral notch
3- superior costal fossa
4- vertebral body
5- inferior costal fossa
6- inferior vertebral notch
7- inferior articular process
8- spinous process
9- transverse costal fossa

Cross vertebrae - sacral vertebrae

Sacral vertebrae **vertebrae sacrales** (Fig. 7) unite during adolescence and form the sacrum. The sacrum is triangular in shape and consists of 4 parts: the base, the apex, and two lateral parts. The anterior surface of the sacrum is involved in the formation of the pelvic cavity. Transverse lines are visible on the anterior surface, their number is equal.



(Fig. 7). Sacral vertebrae
1- base bone sacred
2-superior articular process
3-lateral part
4- sacral pelvic foramen
5- apex of the sacrum
6- transverse lines.

Копчиковые позвонки - coccygeal vertebrae

The coccygeal vertebrae consist of 3 to 5 vertebrae that fuse in adults to form the coccygeal bone. The first coccygeal vertebra usually retains transverse processes. The upper articular surfaces are present at this level . The remaining coccygeal vertebrae lack transverse and articular processes .

Bone union - Syndesmologia

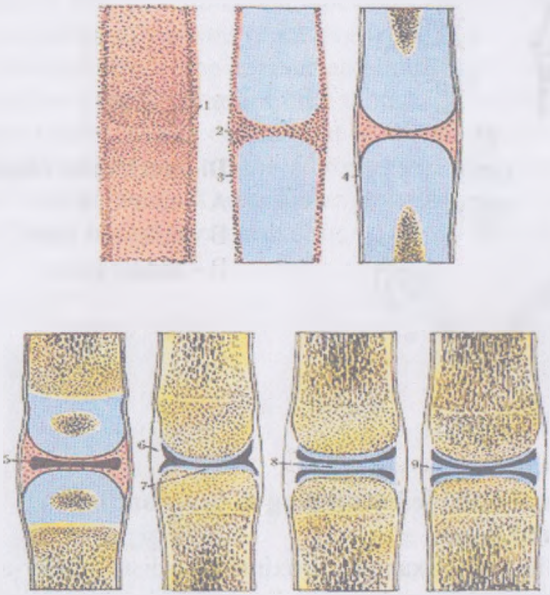
Syndesmologia is a section of anatomy that studies the connections between bones. A bone connection that is made by connective tissue, bone tissue and articular cartilage, is called **a synarthrosis** . If the bones form free moving connections, it is called **a diarthrosis** . There is also an intermediate type of connection called a hemiarthrosis.

Synarthroses are classified as follows:

1. When bones are connected by connective tissue, it is called **syndesmosis** .
2. If the bones are connected by cartilage, it is called **synchondrosis** .
3. If bones are connected by bone tissue, this is called **synostosis** .

The main elements of the joint (diarthrosis):

1. Articular surfaces. Their surface is covered with smooth hyaline cartilage.
2. Articular capsule.
3. Joint cavity.
4. Synovial fluid.
5. Articular cartilage.



Types of joints

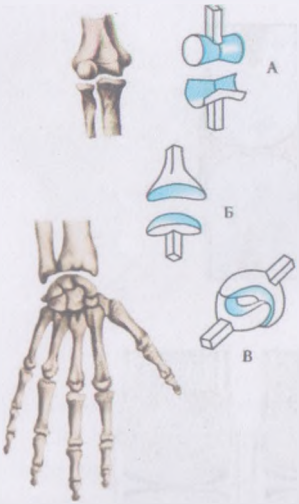
Joints formed by the connection of two bones are called simple joints.

Joints formed by the connection of three or more bones are called complex joints.

Joints that contain a cartilaginous plate are called complex joints.

Joints that have the same structure, are separate from each other, but at the same time perform the same functions, are called combined joints. An example is the temporomandibular joint.

Movements around the sagittal axis: adduction to the body – **adductio,** abduction from the body - **abductio** . Around the frontal axis, flexion is **flexio,** extension is **extensio** . Around the vertical axis, inward rotation is **pronatio,** outward rotation **is supinatio** . **Circumductio** - circular movements around several axes h Opposition - **oppositio,** return to the original position - **repositio** .



Biomechanics of joints (Fig. 8)
A - elbow joint.
B - ellipsoid joint .
B - saddle joint.

Joints are divided according to function:

Uniaxial joints.

1. Cylindrical. Example: proximal and distal radial -ulnar joint.
2. Screw or ball-and-socket. Example: shoulder joint.
3. Block-shaped. Example: connection of fingers of the hand.

Biaxial joints.

1. Saddle-shaped. Example: carpometacarpal joint of the thumb
2. Elliptical. Example: wrist joint.
3. Condylar. Example – knee joint.

Triaxial joints.

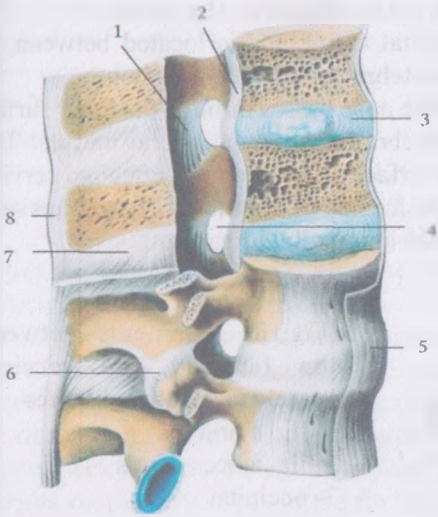
1. Spherical. Example: shoulder joint.
2. Cup-shaped. Example: hip joint.
3. Flat. Example: sacroiliac joint.

Intervertebral joints. Articulatio intervertebralis.

As an example of the connection of the bones of the spine, we can name the articular forms of discontinuous and continuous connection. At the next stage of phylogenesis, the vertebrae are connected by means of cartilage, and these cartilages between their bodies are preserved, and this is an example of synchondrosis. We can also see synostoses when vertebrae fuse. Synostosis can be seen when the sacral vertebrae are connected

together and form one whole sacrum bone. The bodies of adjacent vertebrae are connected to each other by means of intervertebral discs.

Normally, the thickness of the intervertebral disc is 0.2 – 6.0 mm, 5-6 mm in the cervical vertebrae, 3-4 mm in the thoracic vertebrae and 10-12 mm in the lumbar vertebrae. The central part of the disc is the gelatinous nucleus, and the peripheral part is the fibrous ring. They act as shock absorbers for the vertebral body. The articular processes are surrounded by a fibrous capsule. Intervertebral ligaments **(Fig. 9**) are divided into 2 groups: 1. Long 2. Short.



(Fig.9) Intervertebral ligaments
1-lig.flavum.
2-lig. longitudinale posterius
3 - discus intervertebralis
4- for.intervertebral
5-lig. longitudinale anterius
6- lig. Intertransversaria
7- lig. Interspinalia
8- lig. supraspinalis

1 Short ligaments:

1) The arches of the vertebrae are connected by yellow ligaments, which consist of elastic tissues;

2) Between the transverse processes of the vertebrae are located the intertransverse ligaments;

3) The ligaments are located between the spinous processes of the vertebrae;

Long ligaments of the spine:

1. At the back of the spinous process of the vertebra, along its apex, there is a supraspinous ligament. This ligament begins at the 7th cervical vertebra and continues to the middle crest of the sacrum.

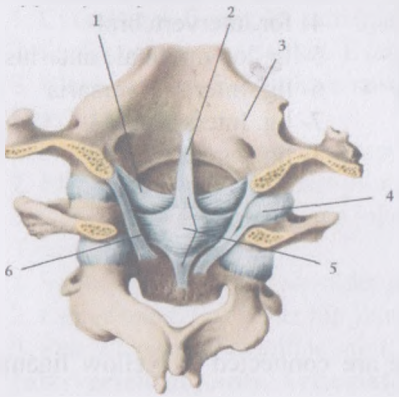
2. The nuchal ligament connects the external protrusion of the occipital bone of the skull and the spinous process of the 7th cervical vertebra.

Ligaments between the 1st and 2nd cervical vertebrae, occipital bones. (Fig. 10)

1) The anterior atlanto-occipital membrane is located between the occipital bone and the anterior arch of the first cervical vertebra;

2) The posterior atlanto-occipital membrane is located between the posterior arch of the first cervical vertebra and the occipital bone;

3) The transverse ligament of the atlas passes through the inner surface of the anterior arch of the first vertebra between the lateral masses. This ligament is located on the posterior surface of the dens of the second cervical vertebra; 4) The cruciate ligament is formed by the fibers of the transverse ligament of the atlas and the posterior longitudinal ligament;



(Fig.10) **Ligaments between the 1st and 2nd cervical vertebrae, occipital bones**
1- lig. alaria
2- lig. apices dentis
3- occipital
4- articulatio atlanto-occipitalis
5- lig. criciforme atlantis
6- lig. transversum atlantis

5) The ligament of the apex of the tooth, drawn from the apex of the tooth of the second cervical vertebra to the back of the head;

6) The pterygoid ligament runs from the lateral surface of the odontoid of the second cervical vertebra to the occipital bone.

The junction between the coccyx and the sacrum

This joint is strengthened by ligaments:

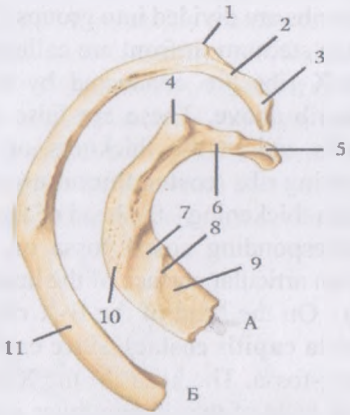
1) superficial posterior sacrococcygeal ligament;
2) deep posterior sacrococcygeal ligament;
3) anterior sacrococcygeal ligament;
4) lateral sacrococcygeal ligament.

Ribs

Ribs **(Fig. 11)** and the sternum together with the thoracic spine are the bones of the chest. Ribs ***(costae)*** are long, narrow and thin bones, shaped like curved plates). In front, the bony part of the rib continues into the cartilaginous part - the costal cartilage. The ribs are divided into groups. The seven upper pairs of ribs that connect to the sternum in front are called the true 2nd ribs ***(costae verae).*** The VIII-X ribs are connected by their cartilages to the cartilaginous part of the rib above. These are false ribs ***(costae spuriae).*** The 11th and 12th ribs end in the thickness of the abdominal muscles. They are called fluctuating ribs ***(costae fluctuantes).***

At the posterior end of the rib there is a thickening - the head of the rib ***(caput costae),*** connecting with the corresponding costal fossa on the thoracic vertebrae. The head of the rib has an articular surface of the head of the rib ***(facies articularis capitis costae)*** . On the head of the II-X ribs is located the crest of the head of the rib ***(crista capitis costae),*** since each of these ribs is connected with two costal semi-fossa. The heads of the XI and XII ribs do not have a crest. Anteriorly, the head of the rib continues into a narrow neck of the rib ***(collum costae)***, passing into the body of the rib ***(corpus costae).*** The neck of the rib has a crest ***(crista colli costae).*** At the IX ribs, at the border of the neck and body, there is a costal tubercle ***(tuberculum costae)*** with articular surface ***(facies articularis tuberculi costae)*** for articulation with the transverse process of the corresponding vertebra. The flattened body of the rib has a convex outer and concave inner surface **(facies externa et interna)** . The angle of the rib (angulus costae) is located lateral to the tubercle of the rib. On the inner surface, the groove of the rib **(sulcus costae)** runs along the bottom of the rib, to which the intercostal vessels and nerve are adjacent. The lower edge of the rib is somewhat pointed, forming the crest of the rib **(crista costae).**

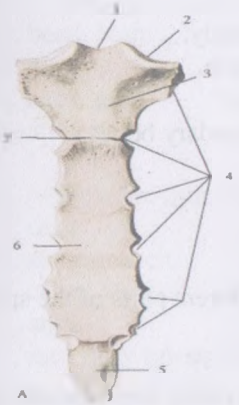
The 1st rib, unlike the other ribs, has an upper and lower surface **(facies superior et facies inferior),** lateral and medial edges **(margo medialis et margo lateralis**). Near the junction with the sternum on the upper surface is the tubercle of the anterior scalene muscle **(tuberculum m. scaleni anterioris)** . In front of it is the groove of the subclavian vein **(sulcus venae subclaviae),** and behind the tubercle is the groove of the subclavian artery *(*sulcus arteriae subclaviae*).* The 2nd rib has a small elevation on its upper surface - the tuberosity of the anterior serratus muscle **(tuberositas m. serrati anterioris).**



(Fig.11) Ribs
B
1- rib tubercle
2- rib neck
3- head of rib
11- body of rib
A.
4- articular tubercle
5- neck of rib
6- rib neck
7- subclavian groove
8- anterior tubercle of the sclera muscle
9- subclavian vein sulcus
10- body of rib

The sternum – the sternum .

Sternum **os sternum (Fig. 12)** has three parts: the upper or manubrium; the body - **corpus** and the xiphoid process - **processus xiphoideus**. A similar notch separates the manubrium of the sternum from the body. On the sternum there is an unpaired jugular notch and paired clavicular, costal notches. Normally, 7 pairs of true ribs are attached to the sternum, of which 1.5 pairs are attached to the manubrium and 5.5 pairs are attached to the body. The xiphoid process of the sternum can be divided into two parts. Inside the sternum, a porous substance rich in blood vessels is well developed. For this reason, the sternum is used for blood transfusions. The bone marrow inside the sternum is well developed and can be taken for transplantation.



(Fig. 12) . Sternum
1- incisura jugularis
2- incisura clavicularis
3- sternum manibrium
4- incisura costalis
5- xiphoid process
6- sternum body
7- angular sternum

Basic terms

Anatomy is the science that studies the structure, shape, and development of the organs of the human body. **Physiology** is the science that studies the vital functions of the human body and the functions of its organs. **Pathological anatomy** studies disease cycles and patterns of disease occurrence. **Anthropometry** is a method of determining the structure and function of the body, which studies height, weight, and other physiological indicators. **Arthrology** is a section that studies joints. **Asthenics** are tall, narrow-chested people. **Auscultation** is a listening method. **Defect** is a developmental defect. **Esthesiology** is a section that studies the sense organs. **Embryogenesis** is the process of embryo development. **Palpation** is a diagnostic method using the fingers. **Articulatio** is a joint. **Articuliatio simplex** is a simple joint - a movable connection of two bones. **Articuliatio Composite** is a complex joint. **Diarthrosis** is a movable joint. **Hemiarthrosis** is a semi-movable joint.

Arthritis is an inflammation of the joints. **Syndesmosis** is a connection of bones by fibrous connective tissue. **Synchondrosis** is a connection of bones by cartilage. Synostosis is ossification of the thin membrane between bones. Synarthrosis is an immobile connection. **Bursitis** is an inflammation of the joint.

Questions for ongoing monitoring

1. Functions of the skeleton in the human body.
2. Bone structure. The functional unit of bone.
3. The main stages of skeletal phylogenesis.
4. Development of bones. Primary and secondary bones.
5. Structure of the spine.
6. Characteristics of the cervical vertebrae.
7. Characteristics of the thoracic vertebrae.
8. Characteristics of the lumbar vertebrae.
9. Differences between the vertebrae in different parts of the spine.
10. Formation of spinal curvatures.
11. Formation of the thoracic skeleton.
12. The unity of structure and function using the example of the structure of the bones of the body.

Test questions

1. What is characteristic only of the first cervical vertebra?

A. tooth socket
B. dens
C. articular processes
D. transverse processes

2. In which vertebrae are the articular surfaces oriented in the sagittal plane?

A. lumbar vertebrae
B. thoracic vertebrae
C. spinal column
D. cervical vertebrae

3. The intermediate sacral crest is formed by the fusion of which processes?

A. articular processes
B. transverse processes
C. spinous processes
D. vertebral arches

4. What parts do vertebrae consist of?
A. head, body
B. pit, body
C. head, arch
D. arch, body

5. How are thoracic vertebrae different from other vertebrae?
A. dens
B. anterior arch
C. costal facets
D. arch
E. accessory tubercle

6. What are the types of ribs?
A. true, false, and floating
B. true and false
C. upper and lower
D. 1st, 2nd, and 3rd ribs
7. Which pairs of ribs are called false ribs?
8.
A. Pairs I–XII
B. Pair IX
C. Pairs VIII–X
D. Pairs I–VII

9. Which pairs of ribs are called floating ribs?
A. Pairs I–VII
B. Pair IX
C. Pairs XI–XII
D. Pairs VIII–X

10. What parts does the sternum consist of?
A. head, body, back
B. body, upper and lower end
C. manubrium, body, xiphoid process
D. head, neck, body

Upper part of the sacrum:

11. A. apex
B. outlet
C. superior surface
D. base

12. Long ligaments of the spine:
A. ligamentum longitudinale laterale et posterius
B. ligamentum longitudinale anterius et posterius
C. ligamenta flava et interspinalia
D. ligamenta longitudinalia et flava

13. How are the vertebral bodies connected?
A. ligaments
B. articular processes
C. crests
D. intervertebral discs

14. How many intervertebral discs are there in the spine?
A. 20
B. 23
C. 25
D. 21

15. Parts of the sternum:
A. manubrium, body, xiphoid process
B. head, body, tip
C. body, xiphoid process, base
D lateral, medial

16. On which ribs are there impressions of the scalene muscles?
A. I, II
B II, V
C. VI, X
D. X, XI

Situational tasks

1. In which plane is the bone cut during an amputation?

A. Frontal
B. Horizontal
C. Sagittal
D. Oblique

2. While performing gymnastics exercises, a girl fell on her buttocks. The next day, she began to feel sharp pain at the site of the impact when trying to sit down or walk. Upon examination of the sacral area, a bruise was found under the skin in its lower third. Which bones could have been damaged?

A. Gluteal bone
B. Sternum
C. Coccyx
D. Femur

3. A child of 11.5 months is examined. The child is developing normally, shows active movements, and can stand. Which spinal curvatures have formed?

A. Thoracic and sacral
B Cervical and lumbar
C. Thoracic and lumbar
D. Cervical, thoracic, lumbar, and sacral

4. During a car accident, the victim's body was in a bent position. Which part of the vertebra is most likely to be fractured?

A. Vertebral body
B. Spinous process
C. Transverse process
D. Articular process

5. During a car accident, the victim's body was bent. Which part of the spine is most likely to be fractured?

A. Sacral
B. Lumbar
C. Thoracic
D. Coccygeal
E. Cervical

TOPIC: Structure and connection of the bones of the shoulder girdle and free upper limb.

Technological model theoretical lesson

Topic No. __ Time 2 hours (80 minutes)	Number of students ___
Form and type of training	Tasks for acquiring new theoretical knowledge
Lecture plan:	1. Structure of the bones of the shoulder girdle; 2. Structure of the bones of the upper limb; 3. Structure of the bones of the hand; 4. Latin name for bones.
Objective of the lesson: to develop students' knowledge about the structure of the bones of the shoulder girdle and upper limb	
Tasks of the teacher: 1. Provides an idea of the structure and connection of the bones of the shoulder girdle. 2. Provides an idea of the structure and fusion of the bones of the free upper limb. 3. Provides an idea of the structure and connection of the bones of the hand. 4. Gives an idea of the Latin names of bones.	Results of educational activities: 1. Will have an idea of the structure and connection of the bones of the shoulder girdle. 2. They will have an idea of the structure and fusion of the bones of the free upper limb. 3. Will have an idea of the structure and connection of the bones of the hand. 4. They will have an idea of the Latin names of bones.
Teaching methods:	Problematic question-answer, conversation, brainstorming, methods "Working with small groups", "Insert".
Form of organization of educational activities:	Work in groups, collectively, individually
Teaching aids :	Lecture texts, handouts, literature, stands .
Conditions of study :	Study room
Ways and means of feedback:	Oral and written control, presentations, group work.

Technological map of the theoretical lesson

No.	Stages of learning	Allotted time	Contents of the training	Educational methods and forms	Educational tools
1.	Organizational part	2 minutes	The students' uniforms and class preparation are checked. The duty officer provides information about students who do not attend classes.	Orally	Magazine, pen
2.	introduction (motivation)	3 minutes	Briefly mention the material of the theoretical lesson related to the topic. Draw the attention of students to the new topic and direct them to study the new topic.	orally	
3.	Description of the new topic	4 5 minutes	Objective: to develop students' knowledge and personal qualities in the subject during the lesson. Topic: Structure and connection of the bones of the pelvic girdle and free bones of the lower limb. Plan 1. Structure and connection of the bones of the pelvic girdle; 2. The structure and connection of the	Brainstorming	Board, chalk, notepad, pen, sheet of paper with test questions and basic phrases.

			bones of the free lower limb; 3. Structure and connection of the bones of the foot; 4. Latin name of bones		
4.	Fixing	25 minutes	Control questions are used to expand the level of students' knowledge, increase their ability to develop independent logic, and consolidate a new topic. The methods "Working with small groups", "Insert" consolidate a new topic and activate students.	Insert	Forms with control questions, tests
5.	The final part	5 minutes	The results of the lesson will be announced and the students will be assessed on a 5-point scale. Encourages students who actively participate in the lesson. Homework is given at the end of the lesson. Topic: Structure and connection of the bones of the pelvic girdle and free lower limb.	Discussion	Board, literature, pen, notebook

Form an answer to the question.

1. What parts does the shoulder blade consist of?
2. Structure of the clavicle.
3. The structure of the tubular bones of the upper limb.
4. Structure of the bones of the hand.

Appendix 2.

Z.N.U. METHOD

Z.N.U. handouts for testing knowledge of the methodology

Concept	I know "+", I don't know "-"	knew "+", didn't know "–".
Dual nomenclature:		
Bones of the shoulder girdle.		
Structure of the scapula.		
Bone structure.		
Structure of the humerus.		
Structure of the wrist bones.		
Structure of the ulna.		
The structure of the phalanges of the fingers.		
Age-related features of finger bones		
Periods of ossification formation.		

" **Insert method** "(after lectures, during theoretical classes, to do homework)

Table

Concepts	V	+	-	?
Determination of the right and left shoulder blade.				
Determination of the right and left clavicle				
Determining the right or left humerus				
Determining the right or left radius				
Determining the right or left ulna				
Names of the proximal phalanges of the fingers				
Names of the distal bones of the fingers				
Periods of ossification of the finger bones				

Bones of the upper limb

Bones related to the bones of the upper limb are divided into two groups: 1) bones of the shoulder girdle (clavicle and scapula). 2) free bones of the upper limb (humerus, radius, ulna, hand).

Bones of the shoulder girdle - ossa cinguli membri superioris.

Clavicle - clavicula

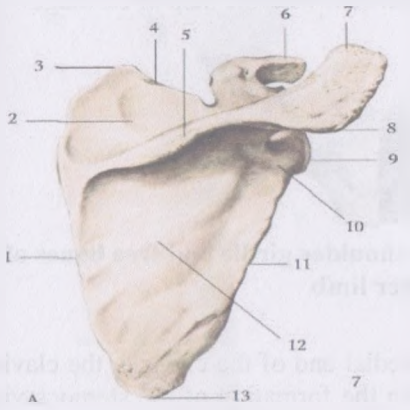
The clavicle is a tubular bone curved in the shape of the letter S and is located between the sternum and the scapula. It has a rounded body (corpus claviculae) and two ends: the sternal end (extremitas sternalis) and the acromial end (extremitas acromialis). The sternal end is thickened and has a sternal articular surface (facies artcularis sternalis) that connects to the sternum.

Its acromial end is thinner than the sternal end. It has a flat articular surface (facies art i cularis acromi alis), connecting with the acromial process of the scapula. The upper surface of the clavicle is smooth. The lower surface has a conical tubercle (tuberculum conoideum) and a trapezoid line (linea trapezoidea) .

Shoulder blade - scapula

Scapula **(scapula), (Fig. 13)** is a flat triangular bone located on the posterolateral side of the chest in the region of the II-VII ribs. There are three angles of the scapula: the upper angle **(angulus superior),** the lateral angle **(angulus lateris)** and the lower angle **(angulus inferior)** . Accordingly, it has three edges: the medial edge **(margo medialis)** faces the spine, the lateral edge **(margo lateris)** faces the outside and the upper edge **(margo superioris) is distinguished** . The back surface of the scapula **(facies dorsalis) is convex. It is divided by the scapular spine (spina scapulae)** projecting backwards into two parts: **fossa infraspinata** and **fossa supraspinata** . The muscles of the same name are located in them. The edge of the scapula rises and expands towards the outer angle and forms the acromion. At its end there is an articular surface **(facies art i cularis acro mialis)** connecting with the clavicle. The anterior costal surface of the scapula **(facies costalis)** forms a slightly curved subscapular fossa **(fossa subscapularis)** . The muscle of the same name lies in it. The outer angle of the scapula thickens and forms a glenoid cavity **(cavitas glenoidalis)** connecting with the head of the humerus. On its upper side there is a supra-

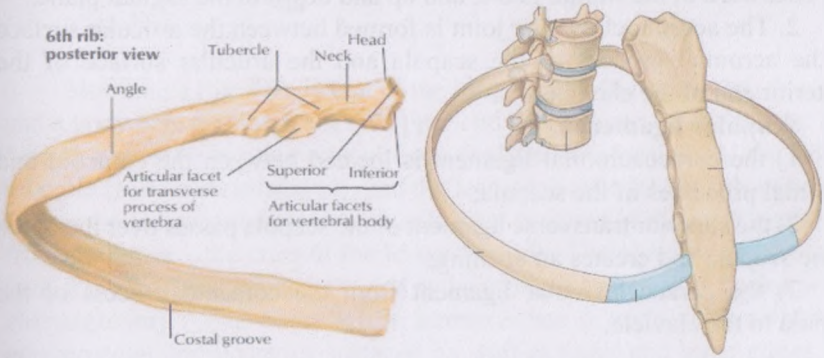
articular tubercle (**tuberculum supraglenoidale**), from which the long head of the biceps brachii muscle begins.



(Fig.13) L is a trap.

1- medial margin
2- supraspinous fossa
3- upper corner
4- upper edge
5- spine of the shoulder blade
6- coracoid process
7- acromion
8- acromion angle
9- glenoid cavity
10- neck of the shoulder
11- lateral margin
12- dorsal face
13- lower corner

The long head of the triceps brachii muscle originates from the infra-articular tubercle **(tuberculum infraglenoidale)** under the glenoid fossa. Behind the glenoid fossa is the narrowed neck of the scapula **(collum scapulae)** . On the upper edge of the scapula there is a notch **(incisura scapulae),** and between it and the neck rises the coracoid process **(processus corocoideus)** .



Fusion of the bones of the chest (Fig. 14) .

Synchondrosis of the thoracic cage consists of:
1) connection of the ribs with the sternum;
2) the connection of the first rib with the sternum;
3) connection of parts of the sternum with the help of cartilage

(Fig. 15) . The connection of the shoulder girdle and free bones of the upper limb

Clavicle junction

The articular surface of the medial end of the clavicle, the clavicular notch of the sternum, participates in the formation of the sternoclavicular joint. The cartilage located inside the joint divides the joint space into two parts. The joint is strengthened from the outside: by ligaments. The bundles of ligaments connecting the two clavicles are directed above the jugular notch of the sternum. According to the shape of the joint, it belongs to the saddle joints.

This makes this joint a multiaxial joint. It moves the clavicle forward and backward in the frontal plane, and up and down in the sagittal plane.

2. The acromioclavicular joint is formed between the articular surface of the acromial process of the scapula and the articular surface of the posterior end of the clavicle.

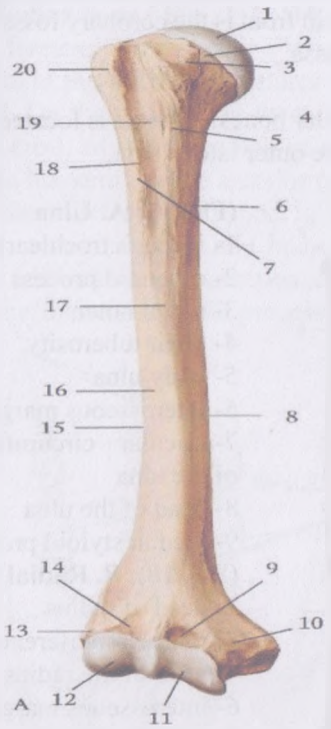
Scapular ligaments:

1) the coracoacromial ligament is located between the coracoid and acromial processes of the scapula;

2) the superior transverse ligament of the scapula passes over the notch of the scapula and creates an opening;

3) the coracoclavicular ligament from the coracoid process of the scapula to the clavicle.

Free bones of the upper limb - Skeleton memri liberi s superioris.
Humerus – humerus



(Fig. 16) . Humerus .
1- caput humeri
2- anatomical collum
3- lesser tubercle
4- surgical neck
5- crest of the lesser tubercle
6- anterior medial face
7- for. nitricum
8- medial margin
9- coronoid fossa
10- medial epicondyle
11- trochlea of the humerus
12- humeral head
13- lateral epicondyle
14- radial fossa
15-lateral margin
16-anterior lateral face
17-deltoid tuberosity
18- crest of the greater tubercle
19- intertubercular groove
20- greater tubercle

Humerus (Fig. 16), is one of the long tubular bones and has two ends and a body between them. At the upper end of this bone are visible the head **(caput humeri),** the anatomical neck **(collum anatomicum),** the greater tubercle **(tuberculum majus),** and the lesser tubercle **(tuberculum minus)** . From the greater tubercle downwards goes the crest of the greater tubercle, from the lesser - the crest of the lesser tubercle. The place where the upper end of the humerus connects to the body is called the surgical neck **(collum chirurgicum)** . The body of the humerus has 3 surfaces: anterolateral, anteromedial and posterior surfaces, as well as outer and inner edges. The lower end of the bone is expanded and forms the condyle of the humerus.

The medial part of the condyle - the trochlea of the humerus - serves to connect with the ulna. The lateral part of the condyle - the head, connects with the radius. Above the block of bone in front is the coronary fossa **(fossa coronoidea),** lateral to it is the radial fossa.

Forearm.

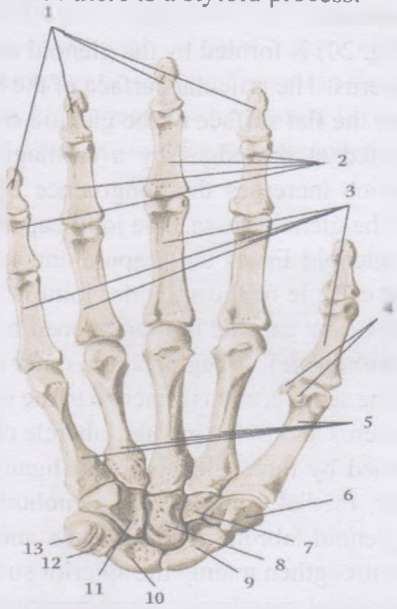
The forearm is formed by two tubular bones: the ulna is located on the inner medial side, and the radius is on the outer lateral side.

(Fig. 17) A. Ulna
1- incisura trochlearis
2- coronoid process
3- radial notch
4- ulnar tuberosity
5- body ulna
6- interosseous margin
7-articular circumference of the ulna
8- head of the ulna
9- medial styloid process
(Fig. 18). B. Radial bone
2- head of radius
3- joint circumference
4- neck of the radius
6- interosseous margin
7- lateral styloid process of the elbow bone radiant bone

Ulna (ulna) - (Fig. 17) has a body, upper and lower epiphyses. On the upper epiphysis there is a trochlear notch **(incisura trochlearis)** for connection with the trochlea of the humerus. There is an ulnar and coronoid process. The body of the ulna has anterior, posterior and interosseous edges, anterior, posterior and medial surfaces. Behind the radial notch is the crest of the supinator (crista m . supinatoris), following downwards and reaching the upper parts of the body of the bone. The anterior edge is rounded, the posterior edge is directed downwards, the pointed interosseous edge faces

the radius. The distal end of the ulna ends in a head, from which the styloid process extends medially.

Radius bone (Fig . 18). This tubular bone is located on the outer side of the forearm. To determine whether it is right or left, you should pay attention to the following features: the head in the proximal part is facing upward. On the lateral side there is a styloid process, and above it supra-styloid crest. At the upper end of the radius there is a head for connection with the humerus. In the anterior region there is a tuberosity of the radius, where the muscles are attached. In the body of the radius there is a posterior margin, anterior margin and interosseous margin. Between these margins there is a lateral surface, anterior and posterior surfaces. At the lower end of the radius there is a styloid process.



(рис.19). Here's what
1- distal phalanx
2- medium phalanx
3- phalanx proximal
4- os
5- metacarpal bone
6- trapezium bones
7- trapezoidal bones
8- the head of the family
9- scaphoid bone
10- moonlight
11- os hamatum
12- your triquetrum
13- pisiform bone

Кости кисти - bones of the hand

Bones of the hand **(Fig. 19)** are divided into three groups: the bones of the wrist, metacarpus and phalanges of the fingers. The bones of the wrist consist of two rows: 4 in the distal row and 4 in the proximal row, a total of

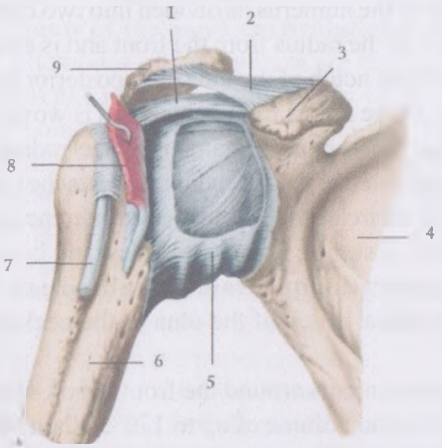
8 bones. The following bones are located in the proximal row : scaphoid, lunate, triquetrum, pisiform. Bones located in the second distal row: trapezium bone, trapezoid bone, capitate bone, hamate bone. Metacarpal bones belong to the group of short tubular bones, which distinguish the following parts: head, body and basal part. Between the 5 metacarpal bones of the hand is the interosseous space of the hand. The number of phalanges on the fingers is 14. The thumb has two phalanges (proximal and distal). The other fingers have 3 phalanges (proximal, medial and distal). The phalanges of the fingers have 3 parts: the base, the body and the head. The distal phalanges differ from the other phalanges in that they do not have a head, but instead have a nail tubercle.

Shoulder joint - Articulatio humeri.

Shoulder joint **(art. humeri)** (Fig. 20) is formed by the glenoid cavity of the scapula and the head of the humerus. The articular surface of the head is spherical, almost 3 times larger than the flat surface of the glenoid cavity of the scapula, which is complemented at the edges by a cartilaginous glenoid lip **(labrum glenoidale)**, which increases the congruence of the articular surfaces and the capacity of the glenoid fossa. The joint capsule is attached to the outer surface of the glenoid lip of the scapula and to the anatomical neck of the humerus. The capsule of the shoulder joint is thin, weakly stretched, free. From above, the joint capsule is strengthened by the coracohumeral ligament **(lig. coracohumerale),** it begins at the outer edge of the base of the coracoid process of the scapula and is attached to the upper part of the anatomical neck of the humerus and to the greater tubercle of the humerus. The joint capsule is thickened by three glenohumeral ligaments **(ligg. glenohumeralia)**. The superior, medial, and inferior glenohumeral ligaments connect the edges of the glenoid labrum of the scapula and the anatomical neck of the humerus; they strengthen mainly the anterior surface of the shoulder joint capsule. The synovial membrane forms protrusions. One of them is the intertubercular synovial sheath **(vagina synovialis intertubercularis)**, which surrounds the tendon of the long head of the biceps brachii muscle, passing through the joint cavity. Another protrusion of the synovial membrane is the subscapularis muscle subtendinous bursa

(bursa subtendinea m. subscapularis), located at the base of the coracoid process, under the subscapularis muscle tendon. The synovial membrane forms **the axillary recess (recessus axillaris)**, located in the lower part of the joint. Near the joint is the subdeltoid bursa *(***bursa subdeltoidea***)*, which often communicates with the cavity of the shoulder joint.

The shoulder joint is spherical, with a large range of motion, which is facilitated by the free joint capsule, a large difference in the size of the articulating surfaces, and the absence of strong ligaments. Around the frontal axis, flexion and extension are performed with a total range of 120°. Relative to the sagittal axis, abduction (to the horizontal level) and adduction of the arm are performed with a range of 100°. Relative to the vertical axis, the shoulder rotates outward (supination) and inward (pronation) with a total range of up to 125°. Circular movements **(circumductio***)* are performed in the shoulder joint. The movement of the upper limb above the horizontal level is performed in the sternoclavicular joint when raising the scapula together with the free upper limb.



(Fig.20) Shoulder joint
1- league. coracohumerale
2- league. coracoacromiale
3- processus corocoideus
4- scapulae
5- joint capsule
6- humerus
7- tendo m.bicepetis brachii
8- vagina synovialis
9- acromion

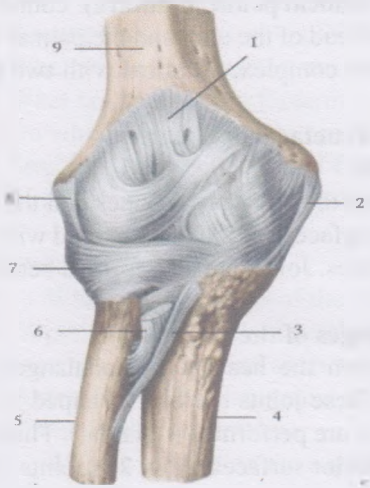
Elbow joint — Articulatio cubiti.

The elbow joint **(art. cubiti) (Fig. 21)** is formed by three bones: the humerus, radius and ulna. The bones form three connections with a common joint capsule. The humeroulnaris joint **(art. humeroulnaris***)*, block-shaped, is

formed by the connection of the trochlea of the humerus with the trochlear notch of the ulna. The humeroradialis joint **(art. humeroradialis),** ball-and-socket, is formed by the connection of the head of the humerus and the glenoid cavity of the radius. The proximal radioulnar joint **(art. radioulnaris proximalis)**, cylindrical, is formed by the articular circumference of the radius and the radial notch of the ulna. The joint capsule is free, it is thinnest in the anterior and posterior parts of the joint. Proximally, it is attached above the articular cartilage of the trochlea of the humerus, the coronary and radial fossae and the fossa of the olecranon are located in the joint cavity. On the ulna, the articular capsule is attached below the edge of the articular cartilage of the coronoid process and at the edge of the trochlear notch of the olecranon. On the radius, the capsule is attached at its neck, forming a saccular depression **(recessus saciformis)** here. The articular capsule is strengthened by ligaments. The ulnar collateral ligament **(lig. collaterale ulnare)** begins on the medial epicondyle of the humerus and is attached to the medial edge of the trochlear notch of the ulna. The radial collateral ligament **(lig. collaterale radiale),** beginning on the lateral epicondyle of the humerus, is divided into two bundles. The anterior one embraces the neck of the radius from the front and is attached at the anterolateral edge of the trochlear notch of the ulna. The posterior bundle of this ligament embraces the neck of the radius from behind and is woven into the annular ligament of the radius. The annular ligament of the radius **(lig. annulare radii)** begins at the anterior edge of the radius and attaches at the posterior edge of the radial notch; it encircles the articular circumference of the head of the radius from the anterior, posterior, and lateral sides, and holds the radius near the ulna. The square ligament **(lig. quadratum)** is a bundle of fibers that connect the distal edge of the radial notch of the ulna to the neck of the radius.

The elbow joint undergoes movements around the frontal axis - flexion and extension of the forearm with a total volume of up to 170°. When flexed, the forearm deviates medially and the hand rests not on the shoulder, but on the chest. Around the longitudinal axis of the radius in the proximal radioulnar joint, the radius rotates together with the hand (simultaneously in

the distal radioulnar joint). In general, the elbow joint is a block joint with a screw-shaped form of sliding of the articular surfaces.



(Fig.21) Elbow joint
1- articular capsule
2- lig. ulnar collateral
3- chorda obliqua
4- os ulna
5- os radii
6- tendo. m. biceps brachii
7- lig. annul a re radii
8- ig. radial collateral
9- os humerus

Joints of the hand - articulationes manus.

The bones of the forearm are connected **(Fig. 22)** to the wrist **by the radiocarpal joint** . The distal end of the radius and the proximal row of carpal bones participate in its formation. The ulna is slightly short, its lower end is filled with cartilage. This plate has a triangular shape, the wider edge is attached to the radial notch, and the end of the ulna is attached to the styloid process.

Ligaments of the wrist joint:

The radial collateral ligament of the wrist **(lig. collaterale carpi radiale)** begins on the styloid process of the radius, goes to the scaphoid bone and reaches the trapezium bone;

The ulnar collateral ligament of the wrist **(lig. collate rale carpi ulnare)** is directed from the styloid process of the ulna to the triquetral bone and partly to the pisiform bone of the wrist. The palmar radiocarpal ligament **(lig. radiocarpeum palmare)** goes downward medially, connects the anterior edge of the articular surface of the radius and its styloid process with the bones of the first row of the wrist and the capitate bone. The dorsal

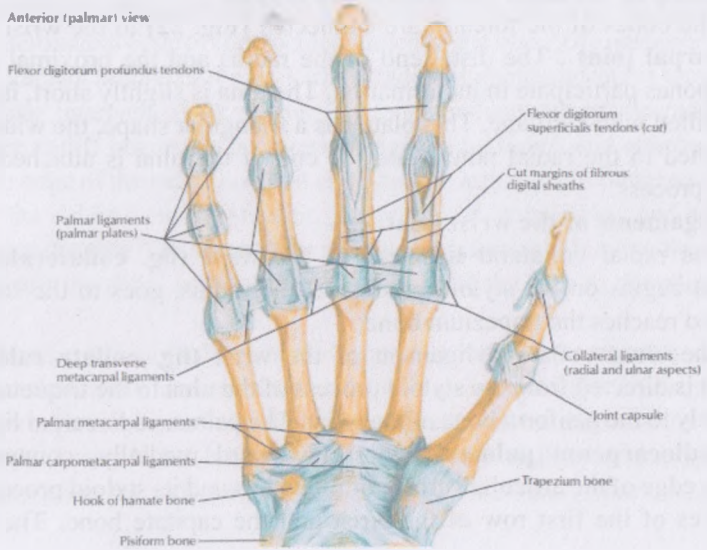
radiocarpal ligament **(lig. radiocarpeum dorsale)** goes from the posterior edge of the articular surface of the radius to the first row of the wrist bones. Palmar ulnocarpal ligament **(lig. ulnocarpeum palmare)** connects the anterior edge of the lower part of the head of the ulna and the palmar surface of the carpal bones. The wrist joint is complex, elliptical with two axes of movement (frontal and sagittal).

Joints between the carpal and metacarpal bones: articulatio carpometacarpalis.

These joints are formed between the metacarpal bones and the second row of carpal bones. Their articular surfaces are flat and covered with strong ligaments on the front and back surfaces. Joints are also formed between the metacarpal bones.

The joints between the phalanges of the fingers.

These joints are formed between the head of the phalanges of the fingers and the base of the finger. These joints are block-shaped in shape, and flexion and extension movements are performed (uniaxial). These joints have ligaments on the lateral and anterior surfaces. **(Fig. 22)** Joints between the carpal and metacarpal bones



Current control questions .

1. Features of the structure of the bones of the hand.
2. What bones are included in the bones of the shoulder girdle?
3. Structure and connection of the bones of the shoulder girdle.
4. What edges does the scapula have?
5. What bones form the forearm?
6. On which side of the arm are the radius and ulna bones located?
7. Structure and connection of free bones of the upper limb.
8. Structure and connection of the bones of the hand.

Test questions

1. What are the angles of the scapula?

A. Superior, inferior, and lateral
B. Internal, external, and supreme
C. Anterior, lateral, and medial
D. Front, back, and bottom

2. What is located on the superior border of the scapula?

A. Coracoid process
B. Scapular notch
C. Spine of the scapula
D. Muscular line

3. What is located on the anterior surface of the scapula?

A. Subscapular fossa
B. Scapular fossa
C. Spine of the scapula
D. Submarginal fossa

4. What structures are located at the proximal end of the humerus?

A. Greater tubercle and head
B. Neck and trochlea
C. Anatomical neck and shaft
D. Head and trochlea

5. What processes are present on the ulna?

A. Coronoid, olecranon, and styloid
B. Coronal and ulnar
C. Ulnar and radial

D. Trochlear and styloid
6. What notches are found on the ulna?
A. Trochlear and radial
B. Ulnar and radial
C. Lateral and trochlear
D. Medial and trochlear
7. What surfaces are present on the radius?
A. Anterior and posterior
B. Anterior and lateral
C. Anterior, posterior, and lateral
D Anterior and medial
8. Which bone is located in the distal row of the carpal bones?
A. Lunate
B. Pisiform
C. Hamate
D. Triquetrum
9. Which bones are located in the proximal row of the carpal bones?
A. Scaphoid
B. Capitate
C. Hamate
D. Trapezoid
10. What is the shape of the shoulder joint?
A. Flat
B. Cone-shaped
C. Spherical
D. Saddle-shaped
11. What type of joint is the elbow joint?
A. Combined
B. Complex
C. Uniaxial
D. Simple
12. What is the shape of the humeroulnar joint?
A. Hinge-shaped (Trochlear)
B. Spherical
C. Flat

D. Cone-shaped

13. What is the shape of the humeroradial joint?

A. Flat

B. Cone-shaped

C. Spherical

D. Ball-and-socket (Spherical)

14. What is the shape of the radiocarpal (wrist) joint?

A. Saddle-shaped

B. Ellipsoid

C. Flat

D. Cylindrical

E. Spherical

15. What is the structure of the radiocarpal (wrist) joint?

A. Simple

B. Complex

C. Uniaxial

D. Multiaxial

E. Compound

Situational tasks

1. A 45-year-old woman came to the trauma department after falling off her bicycle, complaining of pain and swelling in the deltoid region. Which structure and bone fracture is most likely?

A. Deltoid tuberosity

B. Acromial end of the clavicle

C. Surgical neck of the humerus

D. Anatomical neck of the humerus

2. A woman fell on her outstretched arm. Which bone is most commonly fractured in this situation?

A. Upper third of the humerus

B. Clavicle

C. Lower third of the humerus

D. Lower third of the ulna

3. A radiograph shows a fracture of the bone located on the lateral side of the forearm. Which bone is fractured?

A. Ulna

B. Radius
C. Scaphoid
D. First metacarpal

4. During icy conditions, a woman fell on her outstretched arm and felt a sharp pain. There was visible deformity in the lower third of her right forearm, with swelling and limited movement in her right hand. Which bones are most likely damaged?

A. Pelvic bone
B. Radius and ulna
C. Lunate bone and first metacarpal
D. Humerus and scapula

5. When falling on his right arm held close to his body, the victim felt a crack and sharp pain in the upper third of his right shoulder. Movement in the shoulder is impossible due to visible deformity. Which bone is most likely damaged?

A. Ribs
B. Humerus
C. Scapula
D. Clavicle

TOPIC: Structure and Articulations of the Pelvic Girdle and Free Bones of the Lower Limb.

TECHNOLOGICAL MODEL OF THEORETICAL SESSION

Topic No. ___Duration: 2 academic hours (80 minutes)	Number of Students: ___
Uniform	Educational instruction focused on acquisition of theoretical knowledge
Lecture Outline	□ Structure of the bones of the pelvic girdle □ Structure of the bones of the free lower limb □ Structure of the bones of the foot □ Latin nomenclature of the bones
Objective of the Lesson: To develop students' knowledge about the anatomical structure of the pelvic girdle and the free bones of the lower limb.	
Teacher's Tasks: □ Introduce the structure and articulations of the pelvic girdle bones. □ Present the structure and articulations of the bones of the free lower limb. □ Describe the anatomical features and joints of the bones of the foot. □ Familiarize students with the Latin anatomical names of these bones.	Expected Learning Outcomes: □ Students will understand the structure and articulations of the pelvic girdle. □ Students will comprehend the structure and articulations of the free lower limb bones. □ Students will gain knowledge about the bones and joints of the foot. □ Students will recognize and use Latin anatomical terminology appropriately.
Teaching Methods:	□ Problem-based questions and answers □ Discussions □ Brainstorming □ Small group work □ "Insert" method (Interactive Noting System for Effective Reading and Thinking)
Forms of Educational Activity:	□ Group work □ Collective learning □ Individual tasks
Educational Materials:	□ Lectures □ Educational literature

	□ Handouts □ Visual aids and posters
Classroom setting	Classroom setting
Feedback and Assessment Methods:	□ Oral and written assessment □ Presentations □ Group-based evaluation

Lesson Technological Map

№	Stage of the Lesson	Time Allocated	Lesson Content	Teaching Methods and Forms	Educational Materials
1.	Organizational Phase	2 minutes	Checking classroom and student readiness; taking attendance	Oral	Pen, attendance journal
2.	Motivation	3 minutes	Brief discussion to attract students' attention to the new topic	Oral	-
3.	Introduction to New Topic	45 minutes	**Goal:** Develop knowledge of bone structure and joints of the lower limb. Topics: 1) Structure and formation of the pelvis; 2) Structure and formation of the leg; 3) Structure and formation of the foot; 4) Latin terminology	Brainstorming	Board with control questions, notes, pencils
4.	Knowledge Deepening Phase	25 minutes	Expansion of understanding through guided questions; group	"Insert", group work	Test questions, example papers

			work with "Insert" method to reinforce content and critical thinking		
5.	Conclusion	5 minutes	Summary and student evaluation using a 5-point scale; assign homework	Discussion	Board, textbook, pen, notebook

Answer the Questions:

1. 1. What are the components of the pelvis?
2. 2. Describe the structure of the femur.
3. 3. Describe the structure of the long bones of the lower limb.
4. Describe the structure of the bones of the foot.

Group Assignments:

- Group 1:
- Describe the structure of the bones of the lower limb.
- Create a concept map for the word 'pelvis'.
- Group 2:
- Difference between the right and left femur.
- Create a concept map for the word 'femur'.
- Group 3:
- Age-specific features of the bones of the lower leg.
- Create a concept map for the word 'foot bones'.
- Group 4:
- Structural features of the foot bones.
- Create a concept map for the word 'patella'.

Knowledge Assessment Method (Z.N.U.):

This method involves handouts for evaluating knowledge acquired during lectures and theoretical classes. Students indicate their level of understanding using '+/–' symbols.

Terminology Table	I know "+", i didn't know "–"	I knew "+", I didn't know "–".
Nomenclature		
Pelvic girdle bones		
Structure of the femur		
Structure of the tibia		
Structure of the fibula		
Structure of the patella		
Structure of the foot bones		
Articulations of the lower limb bones		

Insert Method:

The 'Insert' method is an interactive system for evaluating knowledge and thinking, which aids in independent study. Lecture topics, books, and other materials are assigned in advance. Students annotate text using the following symbols:

- "V" – confirms what I already know.
- "+" – new information.
- "–" – contradicts what I knew.
- "?" – made me think. I need more information on this.

Insert Table Concepts:

Termins	V	+	-	?
Identification of right and left pelvic bone				
Identification of right and left femur				
Identification of right or left tibia				
Identification of right or left fibula				
Identification of right or left patella				
Naming of foot bones				
Articulations of lower limb bones				

Pelvic Girdle and Free Bones of the Lower Limb:

The hip bone (os coxae)

The hip bone **(os coxae)** is a flat bone that serves both supportive and protective functions. It consists of three parts: the ilium, pubis, and ischium. These bones are separated by cartilage until the age of 16. Their junction forms the acetabulum, which houses the head of the femur.

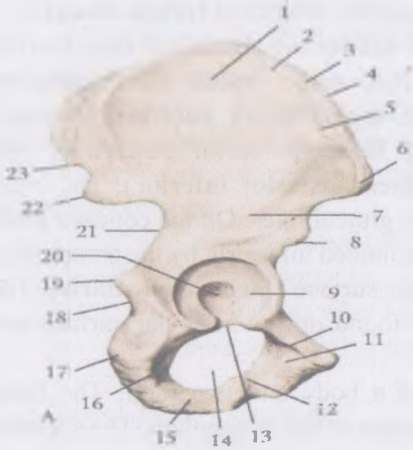
The ilium **(os ilium)** has two parts: the lower expanded body **(corpus ossis ilii)** and the upper wing **(ala ossis ilii),** which is S-shaped and thinned in the middle. The thickened border forms the iliac crest **(crista iliaca).**

The crest serves as an attachment site for the abdominal muscles. On the wing are the anterior superior iliac spine **(spina iliaca anterior superior),** anterior inferior iliac spine **(spina iliaca anterior inferior**), posterior superior iliac spine **(spina iliaca posterior superior),** and posterior inferior iliac spine **(spina iliaca posterior inferior**). The outer surface is the gluteal surface marked by gluteal lines. On the concave inner surface is the iliac fossa **(fossa iliaca),** bounded inferiorly by the arcuate line **(linea arcuata**), starting at the auricular surface **(facies auricularis)**. The iliac tuberosity **(tuberositas iliaca)** is found on the auricular surface and serves for ligament attachment.

The pubis **(os pubis)** consists of a body and two rami. The body **(corpus ossis pubis)** forms the anterior part of the acetabulum. The superior ramus **(ramus superior ossis pubis)** extends anteriorly, downward and medially. Its upper edge forms the pubic crest **(pecten ossis pubis),** while the lower sharp edge forms the obturator crest **(crista obturatoria).** It continues as the inferior **ramus (ramus inferior ossis pubis).** It features the pubic tubercle **(tuberculum pubicum)** and the symphyseal surface **(facies symphysialis).**

The ischium **(os ischii)** consists of a body forming the lower part of the acetabulum and the ramus **(ramus ossis ischii),** which bears the ischial tuberosity **(tuber ischiadicum).** The ischial spine **(spina ischiadica)** separates the greater and lesser sciatic notches **(incisura ischiadica major et minor).** The ramus connects with the inferior pubic ramus to form the

obturator foramen **(foramen obturatum),** which includes the obturator groove **(sulcus obturatorius).**



(Fig. 23) Pelvic Bone:
1-os ilium
2 - labium externum
3 - linea intermedia
4 - labium internum
5 - linea glutea anterior
6 - spina iliaca anterior superior
7 - linea glutea inferior
8 - spina iliaca anterior inferior
9 - facies lunata
10 - crista pubica
11 - ramus inferior ossis pubis
12 - sulcus obturatorius
13 - incisura acetabuli
14 - foramen obturatum
15 - ramus ossis ischii
16 - corpus ossis ischii
17 - tuber ischiadicum
18 - incisura ischiadica minor
19 - spina ischiadica
20 - fossa acetabuli
21 - incisura ischiadica major
22 - spina iliaca posterior inferior
23 - spina iliaca posterior superior

Femur – os femoris:

The femur **(os femoris)** (Fig. 24) is the longest tubular bone in the human body. It consists of a proximal end, a distal end, and a shaft. At the proximal end, the femoral head **(caput femoris)** articulates with the pelvic bone. In the center of the femoral head lies a depression **(fovea capitis ossis femoris),** where the ligament of the femoral head attaches. The neck of the femur **(collum femoris)** lies between the head and the shaft. Also present at

the proximal end is the greater trochanter **(trochanter major),** which is located superiorly and laterally; posteriorly, there is the trochanteric fossa **(fossa trochanterica**). The lesser trochanter **(trochanter minor)** is located at the lower medial part of the neck. The trochanters are connected posteriorly by the intertrochanteric crest **(crista intertrochanterica)** and anteriorly by the intertrochanteric line **(linea intertrochanterica).**

The shaft of the femur **(corpus femoris**) is slightly curved anteriorly and cylindrical in shape. Its anterior surface is smooth, while posteriorly lies the linea aspera, which divides into medial and lateral lips (labium mediale et laterale). The lateral lip extends superiorly to form the gluteal tuberosity **(tuberositas glutea),** where the gluteus maximus muscle attaches, while the medial lip continues as the pectineal line **(linea pectinea).** Inferiorly, the lips diverge and enclose the popliteal surface **(facies poplitea).**

The distal end of the femur is transversely expanded and contains the medial and lateral condyles **(condylus medialis et lateralis).** The medial condyle is larger and features a small adductor tubercle **(tuberculum adductorium).** Posteriorly, an intercondylar fossa **(fossa intercondylaris)** lies between the condyles, and anteriorly, a patellar surface **(facies patellaris).** The intercondylar fossa is separated from the popliteal surface by the intercondylar line **(linea intercondylaris**). The medial condyle continues superiorly and laterally as the medial epicondyle **(epicondylus medialis**).

On the lateral condyle, posteriorly lies the popliteal groove **(sulcus popliteus**), and superior-laterally, the lateral epicondyle **(epicondylus lateralis)** is located.

Patella:

The patella is the largest sesamoid bone, located within the tendon of the quadriceps femoris muscle. It has a rounded base **(basis patellae)** facing superiorly and a tapered apex **(apex patellae)** pointing inferiorly. The posterior articular surface **(facies articularis)** articulates with the femur's patellar surface. The anterior surface **(facies anterior**) is rough and can be easily palpated through the skin.

(Fig. 24) Femur:
1 - trochanter minor
2 - caput femoris
3 - fovea capitis ossis femoris
4 - collum femoris
5 - linea intertrochanterica
6 - trochanter minor
7 - facies anterior
8 - epicondylus medialis
9 - condylus medialis
10 - facies patellaris
11 - condylus lateralis
12 - epicondylus lateralis

Tibia – Bones of the Lower Leg:

The tibia (Fig. 25) features medial and lateral condyles **(condylus medialis et lateralis)** at its proximal end. The top part of both condyles forms the superior articular surface **(facies articularis superior)** that articulates with the femur. Located on the condyles is the intercondylar eminence **(eminentia intercondylaris),** which includes the medial and lateral intercondylar tubercles **(tuberculum intercondylare mediale et laterale)** where cruciate ligaments attach. Posterior to the medial tubercle lies the posterior intercondylar area **(area intercondylaris posterior),** and anterior to the lateral tubercle is the anterior intercondylar area **(area intercondylaris anterior).** Below and lateral to the lateral condyle is the fibular articular facet **(facies articularis fibularis).**

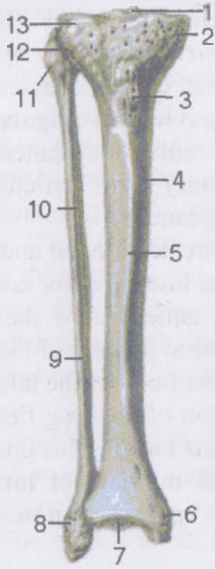
The shaft of the tibia **(corpus tibiae)** has a triangular cross-section with medial, lateral, and posterior surfaces **(facies medialis, lateralis, posterior).** It also contains three borders: anterior border **(margo anterior),** interosseous border **(margo interosseus),** and medial border **(margo medialis).** On the posterior surface of the proximal shaft lies the soleal line **(linea m. solei),** where the soleus muscle attaches.

On the lateral side of the lower epiphysis there is a fibular notch **(incis ura fibularis)** . Medially, the tibia has a flattened and downward-directed

process - the medial malleolus **(malleolus medialis),** on which the articular surface **(facies articularis malleoli medialis) is visible** .

On the lateral side of the lower end of the tibia is the fibular notch **(incisura fibularis)** .

The fibula **is** thin, its proximal end forms the head of the fibula **(caput fibularis)** . On the medial side of the head there is an articular surface of the fibula **(facies articularis capitis fibulae)** for articulation with the tibia. Above, the head forms the apex of the head of the fibula **(apex capitis fibulae),** below, the head passes into the neck of the fibula **(collum fibulae),** continuing into the body of the fibula **(corpus fibulae)** . The body of the fibula is distinguished by lateral, medial and posterior surfaces **(facies lateralis, medialis el posterior),** separated from each other by the anterior edge **(margo anterior)** . interosseous margin **(margo interosseus),** posterior margin **(margo posterior).** The distal end of the fibula is thickened and forms the lateral malleolus **(malleolus lateralis)** for connection with the bones of the foot.



(Fig.25). Big and small ribs
1- eminence intercondular ;
2-medial condyle;
3-tibial tuberosity;
4-tibia;
5- anterior margin;
6-medial malleolus;
7-inferior articular surface;
8-lateral malleolus;
9-interosseous margin of the fibula;
10-fibula;
11-head of the fibula;
12- apex of the fibula head;
13-lateral condyle of the tibia.

Kosti stopy - the bones of the foot

Bones of the foot **(ossa pedis)** (Fig. 26) are divided into the bones of the tarsus, metatarsus and phalanges of the fingers. The bones of the tarsus **(ossa tarsi)** are represented by seven spongy bones. A distinction is made between the talus and calcaneus bones, located in the proximal row, and the bones of the distal row: the navicular, cuboid, as well as the medial, intermediate and lateral cuneiform bones.

The bones of the foot **(ossa pedis)** are divided into the bones of the tarsus, metatarsus, and phalanges of the fingers. The bones of the tarsus **(ossa tarsi)** are represented by seven spongy bones. A distinction is made between the talus and calcaneus, located in the proximal row, and the bones of the distal row: the navicular, cuboid, as well as the medial, intermediate, and lateral cuneiform bones.

The **talus** has a forward-facing head of the talus (caput tali), a body, and a connecting neck of the talus **(collum tali).** The head of the talus has a navicular articular surface **(facies articularis navicularis)** in front for articulation with the navicular bone. On the head below there is an articular surface of the plantar calcaneonavicular ligament **(facies articularis ligamenti calcaneonavicularis plantaris)**, next to which above and laterally is the articular surface of the calcaneonavicular **(bifurcated)** ligament **facies articularis calcaneonavicularis ligamenti (bifurcati)**. Below on the head of the talus there is an anterior calcaneal articular surface **(facies articularis calcanea anterior)** for articulation with the corresponding articular surface of the calcaneus.

On the sides of the talus block there are medial and lateral malleolar surfaces **(facies malleolares medialis et lateralis)** for connection with the malleoli of the leg bones of the same name. Below the lateral malleolar surface on the body of the talus is the lateral process of the talus **(processus lateralis tali).** The posterior surface of the body of the talus is crossed from top to bottom by the groove of the tendon of the long flexor of the big toe **(sulcus tendinis musculi flexoris hallucis longi)**. This groove separates the medial and lateral tubercles **(tuberculi mediale et laterale)** projecting posteriorly, which together form the posterior process of the talus **(processus posterior tali).**

heel bone - the largest bone of the tarsus, located inferiorly and posteriorly from the talus. The calcaneus ends at the back with the calcaneal **tubercle (tuber calcanei)** . From the calcaneal tubercle, the lateral process of the calcaneal tubercle **(processus lateralis tuberis calcanei)** extends laterally . The medial process of the calcaneal tubercle **(processus medialis tuberis calcanei)** extends medially from the inferior part of the calcaneal tubercle. The superior aspect of the calcaneus has anterior, middle, and posterior talar articular surfaces **(facies articularis talaris anterior, media et posterior**) for articulation with the talus. Between the middle and posterior articular surfaces is the calcaneal groove **(sulcus calcanei),** which runs from back to front and laterally. This groove, limited by the talus bone above and by the calcaneus below, participates in the formation of the sinus of the tarsus **(sinus tarsi).** A thickened short process, the support of the talus **(sustentaculum tali),** extends medially from the upper anterior edge of the calcaneus . On the lateral surface of the calcaneus is a longitudinal groove for the tendon of the long peroneal muscle **(sulcus tendinis musculi fibularis longi).** On the lateral surface of the calcaneus, in its anterior part, is a small fibular block **(trochlea fibularis**).

In front of the head of the calcaneus there is a saddle-shaped cuboid articular surface **(facies articularis cuboidea)** for articulation with the cuboid bone.

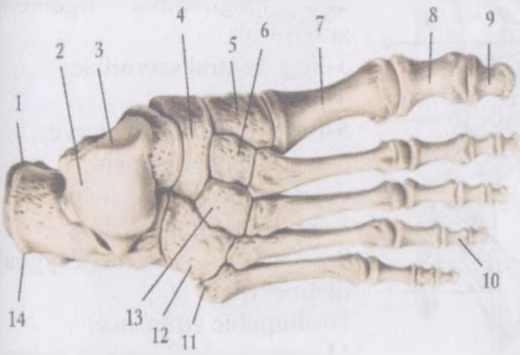
Scaphoid bone **(os naviculare),** flattened, lies in front between the talus and cuneiform bones, in the medial part of the foot. On the back surface of the navicular bone is a concave articular surface for articulation with the head of the talus. The superior side of the navicular bone is convex. The anterior surface of the navicular bone has an articular surface for articulation with the three cuneiform bones. On its lateral side is a cuboid articular surface **(for articulation with the cuboid bone**). The tuberosity of the navicular bone (**tuberositas ossis navicularis**) is noticeable below the navicular bone.

Sphenoid bones **(ossa cuneiformia).** The medial, intermediate and lateral cuneiform bones are located in front of the navicular bone. The back side of the cuneiform bones has articular surfaces for articulation with the navicular bone. The medial cuneiform bone (**os cuneiforme mediale**) has two articular surfaces on its concave lateral side. One of them articulates

with the intermediate cuneiform bone, the other with the 2nd metatarsal bone. The intermediate cuneiform bone (**os cuneiforme intermedium**) has its wide part facing upward. The intermediate cuneiform bone is shorter than the other cuneiform bones, and on its medial surface there is an articular surface for articulation with the medial cuneiform bone. The lateral side of the intermediate cuneiform bone contains an articular surface for articulation with the lateral cuneiform bone. The lateral cuneiform bone (**os cuneiforme laterale**) has articular surfaces on the medial side for articulation with the intermediate cuneiform bone and the base of the 2nd metatarsal bone, and on the lateral side - with the cuboid bone.

Cuboid bone **(os cuboideum)** is located in front of the calcaneus and outside of the lateral cuneiform bone, occupies the lateral part of the tarsus. The medial side of the cuboid bone has articular surfaces for articulation with the lateral cuneiform and navicular bones. The lateral edge of the cuboid bone contains the tuberosity of the cuboid bone **(tuberositas ossis cuboidei)** . In front of the tuberosity of the cuboid bone is the groove of the tendon of the long peroneal muscle (**sulcus tendinis musculi fibularis longi**), passing to the lower side of this bone, where it is directed forward and medially. The cuboid bone has a saddle-shaped articular surface at the back for articulation with the calcaneus.

Metatarsal bones. The five metatarsal bones (**ossa metatarsi**), short tubular, are located between the tarsal bones at the back and the phalanges of the fingers at the front. These bones are counted from the side of the big toe (I) to the little toe (V). Each metatarsal bone has a base, a body and a head. The base of the metatarsal bone (**basis ossis metatarsi**) articulates in its posterior sections with the corresponding bone of the tarsus. On the lower surface of the base of the first metatarsal bone there is a small tuberosity of the first metatarsal bone (**tuberositas ossis metatarsi primi**). At the base of the fifth metatarsal bone on the lateral side there is a tuberosity of the fifth metatarsal bone (**tuberositas ossis metatarsi quinti**) . The head of the metatarsal bone (**caput ossis metatarsi**) is hemispherical in shape and ends in a convex articular surface for articulation with the base of the corresponding proximal phalanx.



(Fig .26). Bones of the feet

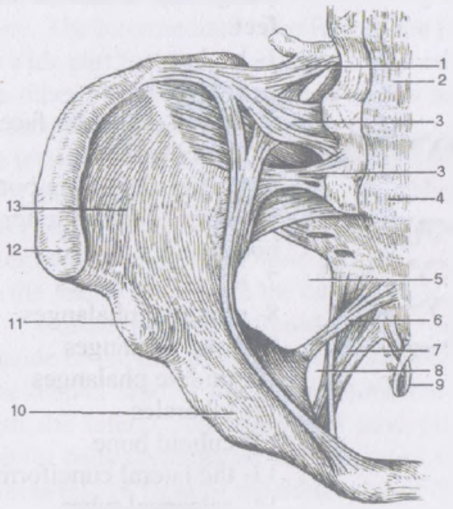
1- heel
2- ankle
3- medial malleolar face
4- navicular bone
5- medial cuneiform bone
6- intermediate cuneiform bone
7- metatarsal bones
8- proximal phalanges
9- distal phalanges
10- middle phalanges
11- tubercles
12- cuboid bone
13- the lateral cuneiforms
14- calcaneal tuber

Body of the metatarsal bone **(corpus ossis metatarsi)** each of them is triangular in shape. The bones (**phalanges**) of the toes (**ossa digitorum**) are shorter and thicker than the bones of the fingers. All toes except the first have proximal, middle and distal phalanges (**phalanges proximalis, media, distalis**). The big toe **(hallux)** has only proximal and distal phalanges. The phalanges are short tubular bones. Each phalanx has a base, body and head **(basis phalangis, corpus phalangis, caput phalangis)**.

Joints of the pelvic bones and the free lower limb

Joint of the pelvic bone.

The sacroiliac joint **(articulatio sacroiliaca)** (Fig. 27) is formed by the auricular surfaces of the pelvic bone and sacrum. The articular surfaces are covered with thick fibrous cartilage, the shape of the articular surfaces of the joint is flat. The joint cavity is slit-like. The joint is strengthened by strong ligaments: the ventral sacroiliac ligaments **(ligg. sacroiliaca ventralia),** the dorsal sacroiliac ligaments **(ligg. sacroiliaca dorsalia),** interosseous sacroiliac ligaments **(ligg. sacroiliaca interossea),** iliolumbar ligament (lig. iliolumbale). Movements in the sacroiliac joint are impossible, which is caused by the complex relief of the articulating surfaces and the tightly stretched joint capsule and ligaments.



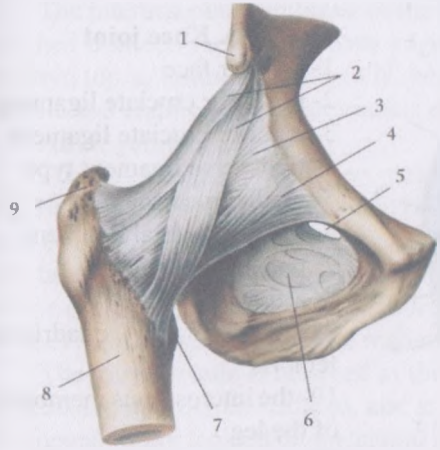
(Fig. 27). Connection of the pelvic bone
1- iliofemoral ligament ;
2nd longitudinal ligament anteriorly;
3-ligg. ventral sacroiliac;
4-promontory;
5-for. greater sciatic nerve;
6-sacrospinal ligament;
7-sacrotuberous ligament;
8-for. ischial muscle less;
9-anterior sacrococcygeal ligament;
10-iliopubic eminence;
11- anterior inferior iliac spine;
12-anterior superior iliac spine;
13-iliac fossa.

The pubic symphysis **(symphysis pubica)** connects the symphyseal surfaces of both pubic bones, between which the interpubic disc (discus interpubicus) is located. The pubic symphysis is strengthened by two ligaments: the superior pubic ligament **(lig. pubicum superiu s),** the arcuate pubic ligament **(lig. arcuatum pubis)** . The pubic symphysis is a semi-joint. The pubic symphysis in women is lower and wider than in men. In women, small movements are possible in the pubic symphysis during childbirth.

In addition to the joints and the ligaments that strengthen them, the pelvic bones are connected to the sacrum by two powerful extra-articular ligaments: the sacrotuberous ligament **(lig. sacrotuberale),** the sacrospinous ligament **(lig. sacrospinale)** . **Hip joint**

The hip joint **(art. coxae) (Fig. 28)** is formed by the semilunar surface of the acetabulum of the pelvic bone and the head of the femur. The articular surface of the pelvic bone is enlarged by the acetabular lip (**labrum acetabulare**), which is a fibrocartilaginous formation firmly connected to the edges of the acetabulum. Ligaments of the hip joint: transverse ligament of the acetabulum (**lig. transversum acetabuli),** iliofemoral ligament (**lig.**

iliofemorale), pubofemorale, **ischiofemorale,** ligament of the head of the femur **(lig. capitis femoris)** .



(Fig.28) Tazoberneny sustav
1- anterior inferior iliac spine
2- iliofemoral lig.
3- joint capsule
4- lig. pubofemoral
5- obturator for .;
6- obturator membrane
7- minor trochanter
8- femoral bones
9- greater trochanter

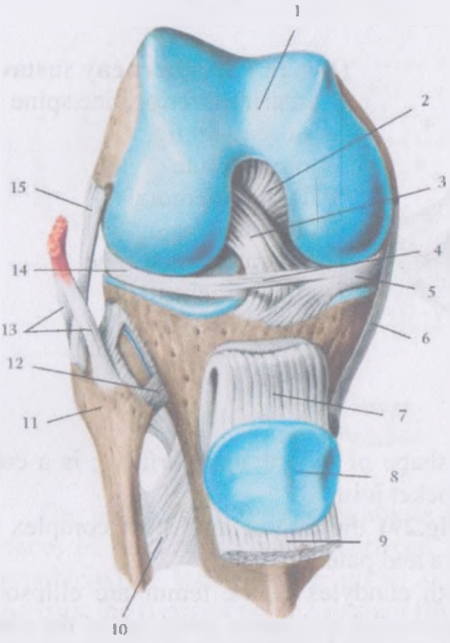
The hip joint, based on the shape of its articular surfaces, is a cup-shaped joint - a type of ball-and- socket joint.

Knee joint. (art. genus), **(Fig.29)** the largest and most complex in structure, formed by the femur, tibia and patella.

The articular surfaces of both condyles of the femur are ellipsoid, slightly concave, articulate with the medial and lateral condyles of the tibia, the patellar surface is flattened. Inside the joint there are crescent-shaped intra-articular cartilages - lateral and medial menisci (**meniscus lateralis el meniscus medialis**), they increase the congruence of the articulating surfaces, and also perform a shock- absorbing role. The anterior ends of the menisci are connected by the transverse ligament of the knee (**lig. transversum genus**).

The joint capsule of the knee joint is thin. The knee joint is strengthened by strong ligaments: the fibular collateral ligament (lig. collateral fibulare), the tibial collateral ligament (**lig. collaterale tibiale**), oblique popliteal ligament (lig. popliteum obliquum), arcuate popliteal ligament (**lig. popliteum arcuatum**), patellar ligament (**lig. patellae**), anterior cruciate ligament (lig. cruciatum anterius), posterior cruciate

ligament (**lig. cruciatum posterius**). The knee joint is complex, composite, condylar, block-rotational.



(Fig.29). Knee joint
1- patellar face
2- posterior cruciate ligament
3- anterior cruciate ligament
4- transverse ligament type
5- medial meniscus
6- tibial collateral ligament
7- patellar ligament
8- articular facet
9- tendon. m. quadriceps femoris
10- the interosseous membrane of the leg
11- bone fibula
12- anterior tibiofibular ligament
13- tendon. m. biceps femoris
14-lateral meniscus
15- fibular collateral ligament

The joints of the bones of the leg and foot.

The bones of the lower leg are connected by the tibiofibular joint, as well as continuous fibrous connections - the tibiofibular syndesmosis and the interosseous membrane of the lower leg. The tibiofibular joint (**art. tibiofibul aris**) is formed by the articulation of the articular fibular surface of the tibia and the articular surface of the head of the fibula. The joint capsule is strengthened by the anterior and posterior ligaments of the head of the fibula (**ligg. capitis fibulae anterius et posterius**).

The tibiofibular syndesmosis (sydesmosis tibiofibularis) is a discontinuous connection between the fibular notch of the tibia in its distal part and the articular surface of the base of the fibula. This connection is

strengthened by the anterior and posterior tibiofibular ligaments (**ligg. tibiofibularia anterius et posterius**).

The interosseous membrane of the leg (membrana interossea cruris) is stretched between the interosseous edges of the tibia and fibula. Its fibers run from top to bottom and laterally, beginning at the interosseous edge of the tibia and ending at the interosseous edge of the fibula.

Ankle joint

The bones of the foot connect to the bones of the lower leg (ankle joint) **(Fig.30)** and among themselves. The bones of the foot form the joints of the tarsal bones, metatarsal bones, and also the joints of the toes. The ankle joint **(art. talocruralis)** is complex, block-shaped, formed by the lower articular surface of the tibia and the articular surfaces of the talus block, the articular surfaces of the medial and lateral malleoli.

The joint capsule is attached at the back and sides along the edges of the articulating articular surfaces, and at the front - 0.5 cm away from them. The ligaments are located on the lateral sides of the joint. On the lateral side of the joint is the lateral collateral ligament (**lig. collaterale laterale**). It is formed by: the anterior talofibular ligament (**lig. talofibulare anterius**) is directed to the neck of the talus; the posterior talofibular ligament (**lig. talofibulare posterius**) — to the posterior process of the talus; the calcaneofibular ligament (**lig. calcaneofibulare**) goes downwards and ends on the outer surface of the calcaneus.

On the medial side of the ankle joint is the medial (deltoid) ligament (lig. media l e, lig. deltoideum), which is divided into the tibionavicular, tibiocalcaneal, anterior and posterior tibiotalar parts. The tibionavicular part (pars tibionavicularis) begins on the medial malleolus and attaches to the dorsal side of the navicular bone. The tibiocalcaneal part (pars tibiocalcanea) begins on the medial malleolus and ends on the support of the talus.

The anterior tibiotalar part (pars tibiotalaris anterior) of the medial ligament runs from the anterior edge of the medial malleolus forward and downward, and is attached to the posteromedial surface of the talus. The posterior tibiotalar part (pars tibiotalaris posterior) begins at the posterior edge of the medial malleolus laterally and downward, and is attached to the posteromedial side of the talus. Flexion and extension occur in the ankle joint.

(Fig. 30) . The ankle joint and the joint of the bones of the foot
1-talocrural joint;
2-medial ligament;
3-talus;
4-talocalcaneonavicular articulation;
5-bone navicular;
6-cuneoavicular joint;
7th medial cuneiform bone;'
8-cuneiform middle bone;
9-tarsometarsal joint;
10-metatarsophalangeal joints;
11-lateral cuneiform bone;
12-bone cuboid;
13-lig. bifurcated;
14-lig. interosseous talocalcaneum;
15-subtalar articulation.

Current control questions.

1. Features of the structure of the bones of the lower limb.
2. Structure and connections of the bones of the pelvic girdle.
3. Features of the structure of the pelvic bones.
4. Sexual differences in the pelvic bones.
5. The structure of the femur and tibia bones.
6. Structure and connection of the bones of the foot.

Test questions

1. What are the surfaces of the ilium?

A. Internal and external
B. Upper and lower
C. Posterior and external

D. Anterior and posterior

2. What separates the greater and lesser sciatic notches?

A. Ischial spine

B. Sacral lines

C. Arcuate line

D. Obturator foramen

3. What separates the greater pelvis from the lesser pelvis?

A. Arcuate line

B. Obturator foramen

C. Groove

D. Ischial crest

4. Which anatomical structure is not found at the proximal end of the femur?

A. Trochanter

B. Trochlea

C. Head

D. Neck

5. Which anatomical structure is found at the proximal end of the femur?

A. Linea aspera

6. B. Lateral border

7. C. Condylar margin

D. Greater trochanter

8. Which anatomical structure is located at the distal end of the femur?

A. Greater trochanter

B. Linea aspera

C. Iliac crest

D. Patellar surface

9. What anatomical structure is located in the distal part of the tibia?

A. Medial condyle

B. Tibial tuberosity

C. Medial malleolus

D. Lateral malleolus

10. What is the anatomical structure of the fibula?

A. Lateral condyle

B. Fibular notch

C. Medial malleolus

D. Lateral malleolus

11. Which bones are located in the proximal row of tarsal bones?

A. Calcaneus, navicular

B. Cuneiform bones

C. Navicular, cuboid

D. Talus, calcaneus

12. To which group of joints does the hip joint belong?

A. Multiaxial

B. Immovable

C. Movable

D. Semi-movable

13. What is the shape of the hip joint?

A. Complex

B. Cup-shaped

C. Flat

D. Biaxial

14. What is the structure of the knee joint?

A. Complex

B. Simple

C. Compound

D. Uniaxial

15. How many metatarsal bones are there?

A. 12

B. 6

C. 5

D. 3

16. Around which axes does the knee joint move?

A. Frontal and sagittal

B. Horizontal and frontal
C. Frontal and vertical
D. Horizontal and vertical
E. Sagittal and vertical

17. Which bones form the ankle joint?
A. Tibia, fibula, and calcaneus
B. Tibia, talus, and calcaneus
C. Fibula, talus, and navicular
D. Tibia, fibula, and talus
E. Tibia, calcaneus, and cuboid

Situational tasks

1. A builder fell from a height onto his left side and felt severe pain in the upper third of his left thigh. He could not stand on his left leg and was unable to move the limb. Swelling and signs of blood loss in the hip area were increasing. Which bone is most likely damaged?

A. Ribs
B. Pubic bone
C. Femoral neck
D. Lumbar vertebrae

2. As a result of the injury, the victim suffered a fracture in the outer lower third of the right shin. In which bone did the fracture occur?

A. Fibula
B. Tibia
C. Talus
D. Calcaneus

3. An X-ray of a newborn's pelvis shows three separate bones connected by cartilage in the acetabular region. What are these bones?

A. Ilium, sacrum, coccyx
B. Ilium, pubis, ischium
C. Pubis, ischium, femur
D. Sacrum, pubis, coccyx

4. A 70-year-old man suffered a femoral fracture after falling. What is the most common site of femoral fractures in elderly people?

A. Upper third
B. Shaft
C. Trochanter
D. Neck

5. An athlete damaged one of the main components of a joint during training. Which structures are the primary components of a synovial joint?

A. Articular cartilage
B. Glenoid labrum
C. Articular discs
D. Menisci

Topic: Structure and Articulations of Skull Bones, Cranial and Facial Bones, and Infant Skull Anatomy

Technological Model of Theoretical Lesson

Topic No: ___ Duration: 2 hours (80 minutes)	Number of Students: ___
Format and Type of Lesson	Educational session aimed at acquiring new theoretical knowledge
Lecture Plan	5. Structure of the skull 6. Structure of the facial part of the skull 7. Latin names of bones 8. Bone pathology
Lesson Objective: To provide students with knowledge about the structure of the skull skeleton and its parts, as well as the structure of the infant skull and the significance of fontanelles.	
Teacher's Tasks: 1. Introduce the structure and articulations of the cranial bones. 2. Explain the structure and articulations of the facial bones. 3. Familiarize students with the Latin terminology of the bones. 4. Provide an overview of bone pathology.	Expected Learning Outcomes: 1. Students will understand the structure and articulations of the cranial bones. 2. Students will comprehend the structure and articulations of the facial bones. 3. Students will be introduced to the Latin names of bones. 4. Students will gain insight into bone pathologies
Teaching Methods	Analysis of challenging questions, discussions, brainstorming, Z.N.U. method, and Insert method.
Forms of Educational Activity	Group work, collective learning, and individual tasks
Educational Materials	Lecture tests, literature, handouts, visual aids
Learning Environment	Classroom
Communication Methods	Oral and written assessments, group collaboration.

Technological map of the lesson

No.	Lesson Phase	Time Allocated	Content	Methods & educational forms	Educational materials
1.	Organizational Phase	2 minutes	Check student and classroom readiness. Take attendance	Oral	Pen, journal
2.	Motivation	3 minutes	Briefly discuss topic-related material to spark student interest and engagement	Oral	-
3.	Introduction to the Topic	45 minutes	Goal: Provide structured knowledge on skull bone anatomy, cranial and facial bones, infant skull structure, and fontanelles	Brainstorming	Board, chalk, pen, notebook
4.	Consolidation	25 minutes	Use control questions to enhance logical thinking and deepen knowledge through group work, Z.N.U., and Insert methods.	"Z.N.U.", "Insert"	Control questions, test examples
5.	Conclusion	5 minutes	Announce results, evaluate participation, assign homework on 'Muscles of the head and neck'.	Discussion	Board, textbook, pen, notebook

Group Assignments:

- Group 1:
- 1. Characterize the bones of the cranial part of the skull.
- 2. Create a concept map for the term 'frontal bone'.

- Group 2:
- 1. Describe the structure of the frontal bone.
- 2. Create a concept map for the term 'cranial bones'.
- Group 3:
- 1. Describe the structure of the occipital bone.
- 2. Create a concept map for the term 'facial bones'.
- Group 4:
- 1. Explain the structure of facial bones.

2. Create a concept map for the term 'skull'.

Assessment Criteria (Points):

Group	Task 1	Task 2	Q1/Q2/Q3 (0.2 each)			Total
	(1,0)	(1,4)	Question-1	Question-2	Question-3	(3,0)
1						
2						
3						
4						

Z.N.U. Method (Knowledge Control):

Term	Know "+", don't know "–"	knew "+", didn't know "–".
Binary Nomenclature:		
Structure of the sphenoid bone		
Structure of the frontal bone		
Structure of the occipital bone		
Structure of the ethmoid bone		
Age-specific anatomical features of cranial bones		
Facial bones of the skull		
Structure of the zygomatic bone		
Structure of the maxilla		
Structure of the mandible		
Structure of the palatine bone		
Structure of the lacrimal bone		
Structure of the nasal bone		
Structure of the hyoid bone		
Structure of the vomer		

Handout-based assessment method to evaluate knowledge gained during lectures and practical lessons.

Application-3.

Insert Method (Independent Learning Evaluation):

(after lecture, practical word, hometask)

The Insert method is an interactive reading and thinking evaluation system that assists in self-study. Students are assigned lecture topics, books, and other materials beforehand. After reading, they mark content using:

- "V" – confirms what I already know.
- "+" – new information.
- "–" – information I didn't know.
- "?" – made me think; I need more information.

Insert Table Concepts:

Term	V	+	-	?
Cranial part of the skull				
Structure of the frontal bone				
Structure of the occipital bone				
Structure of facial bones				
Structure of the maxilla				
Structure of the mandible				
Age-specific features of the listed bones				

Cranium – Skull

The cranium consists of several individual bones. Each bone, based on its structural characteristics, belongs to the group of spongy, mixed, or flat bones. The skeletal structure of the skull is divided into two main regions:

a) the facial part of the skull;

b) the cranial (neurocranial) part of the skull.

Occipital Bone – os occipitale:

The occipital bone (**os occipitale**) (Fig. 31) is located in the posteroinferior part of the cranial cavity. It comprises the basilar part, two lateral parts, and the squamous part, which enclose the foramen magnum. The anterior margin of the foramen is higher than the posterior. Along its posterior semicircle lies a bony ridge (4–7 mm thick), the attachment site for

the posterior atlanto-occipital membrane. The dura mater attaches to the inner margin of the foramen, surrounded by the marginal sinus. The basilar part (pars basilaris) is located anterior to the foramen and articulates with the sphenoid bone, forming the clivus where the brainstem rests. On its inferior surface is the pharyngeal tubercle (**tuberculum pharyngeum**), where the pharyngeal raphe and anterior longitudinal ligament attach. Foveae on either side of the tubercle are attachment points for the longus capitis and rectus capitis anterior muscles. Borders of the basilar part form the groove for the inferior petrosal sinus (**sulcus sinus petrosi inferioris**), which is associated with the dural venous sinus. The outer margin connects to the petrous part of the temporal bone, forming the petro-occipital fissure (**fissura petrooccipitalis**), filled with cartilage.Occipital Bone – os occipitale:

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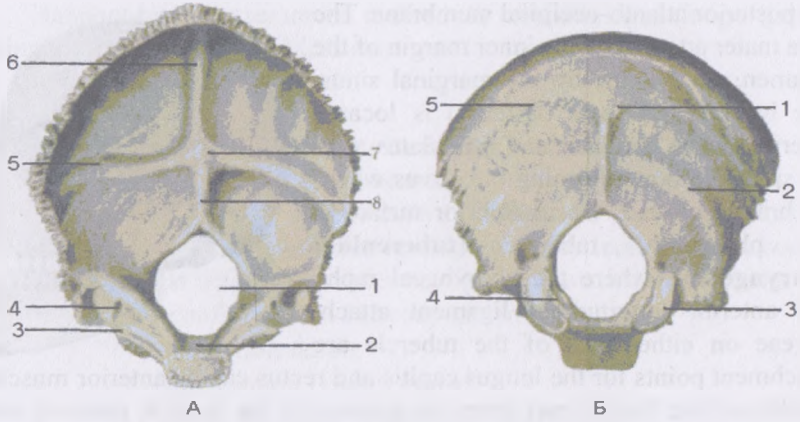


(Fig. 31). Occipital bone

A internal surface

1-large occipital foramen; 2-slope; 3-sulcus of the inferior petrosal sinus;

4-condylar canal; 5- transverse sinus groove; 6-superior sagittal sinus groove;

7-internal occipital protuberance; 8-internal occipital crest.

B. outer surface

1-external occipital protuberance; 2-line of the inferior nucha; 3-occipital condyle;

4-lateral part; 5-upper nuchal line.

Lateral part **(pars lateralis)** occipital bone, paired, at the back passes into its squama. Each lateral part contains an ellipsoid elevation below - the occipital condyle (condylus occipitalis), necessary for articulation with the first cervical vertebra. The surface of each occipital condyle is convex. Behind the condyle is the condylar fossa (fossa condylaris), and at its bottom is an opening leading to the condylar canal (canalis condylaris), 8 mm long, 3 mm in diameter, through which the vein of the same name passes. At the base of the condyle there is a canal of the hypoglossal nerve (canalis nervi hypoglossi) with an average length of 8 mm, a diameter of 4-5 mm, through which the nerve of the same name and

the venous plexus pass. The jugular notch (incisura jugularis) is visible on the side of the occipital condyle, which has a small intrajugular process (processus intrajugularis). The jugular notch is limited posteriorly and lateralward by the jugular process (processus jugularis), on its outer surface is a small paramastoid process (processus paramastoideus), to which the lateral rectus capitis muscle is attached. Nearby, on the cerebral surface, is noticeable the groove of the sigmoid sinus (sulcus sinus sygmoidei), anteriorly and medially to the groove is a small jugular tubercle (tuberculum jugulare), located on the border of the basilar and lateral parts of the occipital bone.

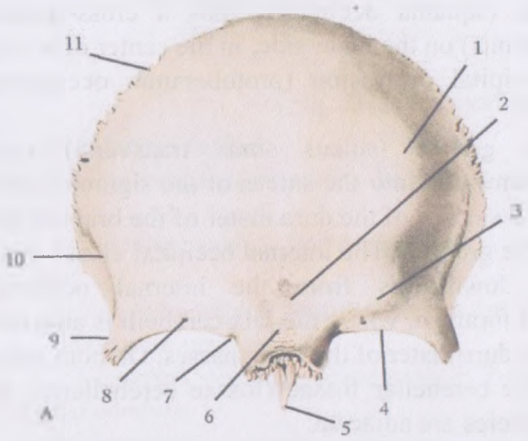
The occipital squama (squama occipitalis) has a cross-shaped elevation (eminentia cruciformis) on the inner side, in the center of which is located the internal occipital protrusion (protuberantia occipitalis interna).

the transverse sinus groove (sulcus sinus transversi) runs transversely, continuing downwards into the sulcus of the sigmoid sinus (sulcus sinus sigmoidei). The sinuses of the dura mater of the brain of the same name are adjacent to the grooves. The internal occipital crest (crista occipitalis interna) runs downwards from the internal occipital protuberance to the occipital foramen, where the falx cerebelli is attached and the occipital sinus of the dura mater of the brain passes. On both sides of the occipital crest are the cerebellar fossae (fossae cerebellaris), to which the cerebellar hemispheres are adjacent.

On the back surface of the occipital squama is the external occipital protuberance (protuberantia occipitalis externa) - one of the places of origin of the trapezius muscle. From the external occipital protuberance to the occipital foramen runs the external occipital crest (crista occipitalis externa). From the external occipital protuberance to the sides diverge the paired superior nuchal lines (linea nuchae superior), above and parallel are the paired highest nuchal lines (linea nuchae supremae), and below - the inferior nuchal lines (linea nuchalis inferior), to which the occipital muscles and fascia are attached.

Frontal bone - os frontales

The frontal bone (Fig. 32) is divided into the following parts: the squamous part is located vertically; the nasal and orbital parts are horizontal. The squamous part consists of two surfaces: the outer surface and the inner surface. There are two tubercles on the outer surface. The superciliary arch is located under these tubercles. The area between the tubercles and arches is called the bridge of the nose. On both sides of the frontal bone there are processes that connect to the cheekbones, related to the facial bones.



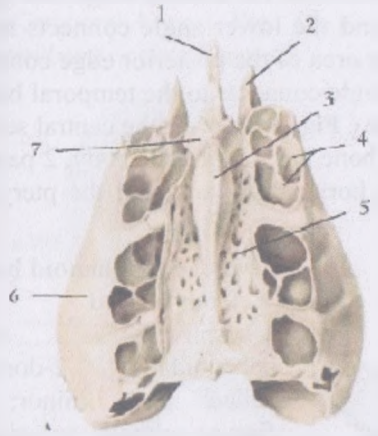
(Fig. 32) Frontal bone

1- frontal tuber
2- glabella
3- arcus superciliaris
4- supraorbital margin
5- nasal spine
6- frontal suture
7- supraorbital notch
8- supraorbital foramen
9- zygomatic process
10- time line
11-margo parietal is

Ethmoid bone - os ethmoidale

The ethmoid bone **(Fig. 33**) is located in the upper part of the nasal cavity and fills the ethmoid notch of the frontal bone, has the shape of the letter T. In the upper part of the bone it consists of a horizontally located ethmoid plate with many openings. From which a vertically located perpendicular plate extends downwards.

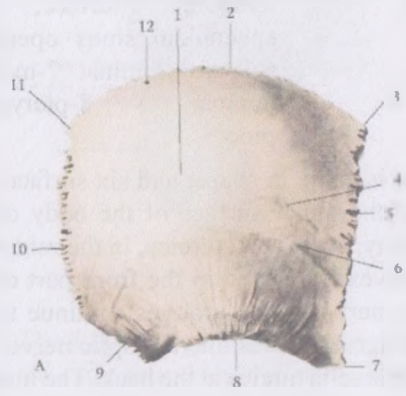
The perpendicular plate of the ethmoid bone divides the nasal cavity into two cavities. The ethmoid bone is connected to the sphenoid and frontal bones above, and to the nasal bones and vomer below. The ethmoid bone participates in the formation of the inner wall of the orbit.



(Fig . 33). Ethmoid bone
1- lamina perpendicularis
2- nasal concha media
3- Crista Galli
4- labyrinthus ethmoidalis
5- sieve plate
6- orbital plate
7- wing of a rooster's comb

Parietal bone- os parietale

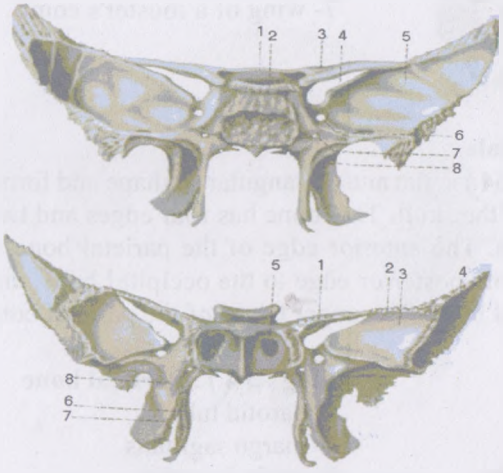
The parietal bone (**Fig. 34**) is flat and rectangular in shape and forms the two upper lateral walls of the skull. This bone has four edges and two external and internal surfaces. The anterior edge of the parietal bone is attached to the frontal bone, the posterior edge to the occipital bone, and the lower edge to the temporal bone. The upper edges of the parietal bone are connected to each other.



(Fig . 3 4) . Parietal bone
1- parotid tube
2- margo sagittalis
3- angle frontalis
4- line superior temporal
5- Margo Frontalis
6- inferior temporal line
7- sphenoidal angle
8- margo squamosus
9- mastoid angle
10- occipital margin
11- occipital angle
12- parietal foramen

The skull has four angles. In the area of the anterior edge, the upper angle connects to the frontal bone, and the lower angle connects to the sphenoid bone. The upper angle in the area of the posterior edge connects to the occipital bone, and the lower angle connects to the temporal bone.

Sphenoid bone - os sphenoidale (**Fig. 35**) forms the central section at the base of the skull. The sphenoid bone has 4 parts: the body, 2 pairs of large and small wings located in the horizontal plane, and the pterygoid processes.



(Fig . 35). Sphenoid bone
A. from behind
1-corpus ossis sphenoidalis; 2-dorsum sellae; 3-ala minor; 4-fissura orbitalis superioris; 5-ala major; 6-for. rotundum; 7-canalis pterygoideus; 8-processus pterygoideus.
B- front part
1-lesser wing; 2-greater wing; 3-orbital surface; 4-temporal surface; 5-sphenoidal sinus opening; 6-lateral lamina; 7-medial lamina; 8-pterygoid process.

The body of the sphenoid bone is cubic in shape, and six surfaces are distinguished. In the middle part of the upper surface of the body of the sphenoid bone, facing the cranial cavity, is the sella turcica, in the middle of which is the pituitary fossa. The convexity located in the front part of the fossa is the intersection of the optic nerve. These grooves continue to the canals, where the 2nd pair of cranial nerves passes into the optic nerve. The sella turcica is limited by the back of the sella turcica at the back. The internal carotid artery passes in the carotid groove on the lateral surface of the body.

Temporal bone - os temporale

Temporal bone (**Fig. 36**) - paired, located between the parietal, sphenoid and occipital bones.

(Fig. 36). **Temporal bone**

A - inner surface

1-eminentia arcuata; 2-tegmen tympani; 3-pars petrosa; 4-sulcus sinus sigmoidei; 5-apertura externa canaliculi cochleae; 6-processus styloideus; 7-apertura externa aqueductus vestibuli; 8-porus acusticus internus; 9-sulcus sinus petrosi superioris; 10-processus zygomaticus.

B- lower surface

1-zygomatic process; 2-petrosquamous fissure; 3-musculotubal canal; 4-external carotid foramen; 5-petrous fossa; 6-external opening of the cochlear canal; 7-jugular fossa; 8-occipital artery sulcus; 9-mastoid notch; 10-mastoid processes; 11-stylomastoid foramen; 12-external acoustic meatus; 13-mandibular fossa; 14- articular tubercle.

The following parts of the temporal bone are distinguished: the tympanic part, the squamous part, the pyramidal or petrous part. These parts of the temporal bone are located around the external auditory canal. Inside the

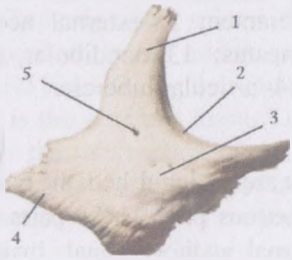
temporal bone are the middle ear and its cavity, the organs of hearing and balance, which make up the inner ear. From this part, a process comes forward, connecting with the cheekbones. At the base of this process there is a mandibular fossa for connection with the head of the lower jaw bone. From the tympanic part of the temporal bone, the external auditory opening continues into the external auditory canal. Between the squamous and tympanic parts of the temporal bone there is a fissure, which, due to the presence of the process of the petrous part, is divided into two: the squamopetrous fissure and the petrotympanic fissure. Nerves pass through these fissures. On the outer surface of the temporal bone, the groove of the temporal artery is visible.

Bones of the facial skull.

The facial part of the skull is divided into paired and unpaired bones: paired bones - the upper jaw, palatine bone, zygomatic bone, lacrimal bones, nasal, inferior nasal concha and unpaired bones: lower jaw, vomer, hyoid bone.

Zygomatic bone – os zygomaticum .

The zygomatic bone (Fig. 37) is connected to the maxillary bone by its lower end on the anterior side. Its function is to form the outer wall of the orbit. The upper angle is connected to the forehead bone, resulting in the frontal process. Since it is connected to the temporal bone on the lower side, it forms the temporal process. The zygomatic bone has an orbital and temporal surface. On the orbital surface there is an orbitozygomatic opening, on the lateral surface - a zygomaticofacial opening, and on the temporal surface - a zygomaticotemporal opening. These openings connect with each other and form the zygomatic canal .



(Fig.37) . Zygomatic bone
1- frontal process
2- orbital face
3- lateral face
4- temporal process
5- zygomaticofacial foramen

Palatine bone - os palatine

The palatine bone is located between the pterygoid processes of the sphenoid bone and the bone of the maxilla. This bone participates in the formation of the wall of the oral cavity, the pterygopalatine fossa, the orbit and the nasal cavity. The palatine bone consists of horizontal and vertical plates.

Lacrimal bone – os lacrimale

(**Fig . 38**) **Lacrimal bone**
1- rocessus frontalis
2- orbital facies
3- Lateral facies

The lacrimal bone (**Fig. 38**) participates in the formation of the inner wall of the orbit. The lower edge connects with the maxilla, and the upper edge connects with the nasal parts of the frontal bone. The edge of the lacrimal duct is visible on the lateral surface. The lacrimal bone participates in the formation of the medial wall of the orbit and the lacrimal canal, which opens into the inferior nasal passage.

Nasal bone - os nasale.

The nasal bone is a quadrangular flat bone, its function is to form the wall of the nasal cavity. They are connected by the medial edges. The lateral edges merge with the frontal process of the maxilla. The upper edge connects with the nasal edge of the frontal bone. The lower edge is free and limits the pyriform opening of the nasal cavity.

Ploughshare.

The vomer is a flat, quadrangular bone. The upper edge is divided into two wings. Between these wings is the groove of the palatine bone. The lower edge of the vomer is connected to the maxilla. The anterior edge is connected to the perpendicular plate of the ethmoid bone. The vomer divides the nasal cavity into two parts.

Hyoid bone – os hyoideum

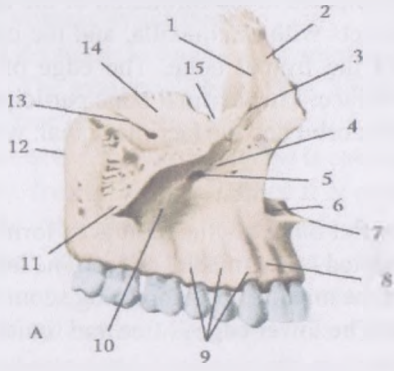
Hyoid bone (**Fig. 39**) – does not participate in the formation of the skull bones. This bone is located between the neck muscles. Its location

corresponds to the region of the sixth cervical vertebra. It is connected to the skull bones by ligaments and muscles. The hyoid bone has a body, a pair of large and small horns.

(Fig.3 9). Hyoid bone
1- cornua majora
2- cornua minor
3- corpus

Upper jaw – maxilla

Upper jaw (**Fig. 40**) participates in the formation of the facial part of the skull, by its structure it belongs to the group of spongy bones. This bone has four processes and a body. Processes: frontal process, zygomatic process, palatine process, alveolar process.



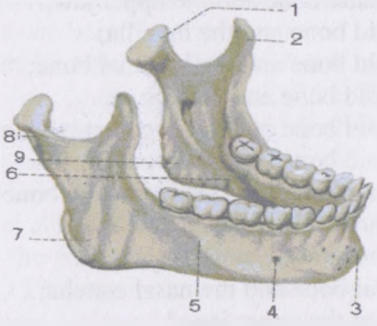
(Fig . 40). Upper jaw
1- anterior lacrimal crest . 2- frontal process. 3- infraorbital margin.4-anterior face . 5- infraorbital foramen. 6- nasal notch. 7- anterior nasal spine. 8- alveolar arch. 9- alveolar ridge.10- maxillary body. 11- zygomatic process.12- maxillary tubercle. 13- infraorbital sulcus.14- orbital face.15- lacrimal notch .

Inside the upper jaw there is a large air-filled cavity communicating with the nasal cavity. The body of the upper jaw bone has four surfaces: a) the surface of the orbit b) the surface of the nose d) the anterior surface c) the infratemporal surface.

Lower jaw

The lower jaw (**Fig. 41**) is movably connected to the bones of the skull. The body of the bone consists of parts of horizontally located and vertically oriented branches. The body of the lower jaw consists of its base

and the alveolar part, where the teeth are located. On the inner surface of the branches of the lower jaw, the opening of the mandibular canal is visible. There are two processes on the branch of the lower jaw. The temporal muscle joins the coronoid process located in front. The process located behind participates in the formation of the joint of the lower jaw. Between the two processes on the branch of the lower jaw, the mandibular notch is visible.



(**Fig . 41**). **Lower jaw**
1-processus condylaris;
2-processus coronoideus;
3-protuberantia mentalis;
4-for mentality;
5-line oblique;
6-line mylohyoidea;
7-tuberositas masseterica;
8-collum mandibulae;
9-tuberositas pterygoidea

Fusion of the bones of the skull

The bones of the skull are connected to each other by means of sutures. The bones that make up the base of the skull are connected by a connective tissue plate, which is replaced with bone tissue with age (synostosis). Ossification occurs between the following bones:

1) between the occipital and sphenoid bones;

2) between the sphenoid bone and the petrous part of the temporal bone;

3) between the occipital bone and the temporal bone;

4) between the ethmoid bone and the sphenoid bone;

Sutures between the bones of the skull:

1. coronal suture;
2. sagittal suture;
3. occipital suture;
4. suture between the mastoid process and the occipital bone;
5. suture between the frontal bone and the sphenoid bone;
6. suture between the sphenoid bone and the ethmoid bone;
7. suture between the squamous part of the temporal bone and the sphenoid bone;

8. suture between the parietal and sphenoid bones;
9. suture between the nasal bone and the frontal bone;
10. suture between the ethmoid bone and the frontal bone;
11. suture between the upper jaw and the frontal bone;
12. suture between the lacrimal bone and the frontal bone;
13. suture between the zygomatic bone and the frontal bone;
14. suture between the zygomatic bone and the upper jaw;
15. suture between the ethmoid bone and the maxilla;
16. suture between the ethmoid bone and the lacrimal bone;
17. suture between the sphenoid bone and the vomer;
18. suture between the sphenoid bone and the zygomatic bone;
19. suture between the sphenoid bone and the upper jaw;
20. suture between the temporal bone and the zygomatic bone;
21. suture between the nasal bones;
22. suture between the nasal bone and the upper jaw;
23. suture between the lacrimal bone and the nasal concha;
24. suture between the bones of the upper jaw;
25. suture between the palatine bone and the maxillary bone;
26. suture between the ethmoid bone and the palatine bone;
27. middle suture of the palatine bone;
28. transverse suture of the palatine bone;

III. Connection of the skull bones by cartilages:

1. synchondrosis between the sphenoid and occipital bones;
2. synchondrosis between the sphenoid bone and the petrous part of the temporal bone;
3. synchondrosis between the petrous part of the temporal bone and the occipital bone;

4. Synchondrosis between the sphenoid bone and the ethmoid bone.

Temporomandibular joint – articulation temporomandibularis .

The head of the lower jaw and the fossa of the temporal bone participate in the formation of this joint. Inside the joint, between the head and the temporal bone, there is an intra-articular disc dividing the joint cavity into two parts: lower and

upper. As a result, the bulge on the temporal bone is inside the capsule. The joint capsule continues in the lower part to the neck of the lower jaw.

The temporomandibular joint (Fig. 42) is a block joint by its shape. Since both joints move simultaneously, these joints are considered combined. Movements in the joint: the lower jaw rises and falls; movements to the side; forward and backward.

Age-related changes in the skull.

In a newborn baby, the brain part of the skull is 8 times larger than the facial part (in adults, 2 times). The bones are connected to each other by cartilage or connective tissue. The frontal and parietal tubercles are significantly pronounced. In the skull of newborn children, fontanelles are distinguished, which consist of connective tissue.

1) The anterior fontanelle is located between the frontal and parietal bones and closes at the age of 2 years; 2) The posterior fontanelle is located between the parietal bones and the occipital bone and closes at 2-3 months of age; 3) The anterior lateral fontanelle is located between the parietal bone, frontal bone, temporal bone and sphenoid bone and closes in 2-3 months . 4) The posterior lateral fontanelle is located between the temporal bone, parietal bone and occipital bone and closes by 2-3 months of age. There is cartilaginous tissue between the bones of the base of the skull – the cartilaginous stage. The growth of the skull occurs due to the connective tissue of the fontanelles and the cartilages of the skull.

Current control questions.

1. Describe the bones of the cranium.
2. The structure and connection of the bones that make up the cranium.
3. Structure and connection of the bones of the facial skull.
4. Pneumatic bones.
5. Prenasal sinuses and their significance.
6. What shape are the bones of the skull?
7. Characteristics of the skull bones in children.

Test questions

1. What is the Latin name for the skull?

A. Vertebra

B. Scapula

C. Sacrum
D. Cranium
2. What are the parts of the occipital bone?
A. Squama, lateral parts, basilar part
B. External occipital protuberance and lateral parts
C. Lateral and middle parts
D. Middle and lateral parts
3. What is found in the sphenoid bone?
A. Foramen rotundum and foramen spinosum
B. Foramen rotundum, foramen caroticum
C. Foramen ovale, jugular foramen
D. Foramen spinosum, supraorbital foramen
4. Processes of the palatine bone:
A. Pyramidal process, orbital process
B. Pyramidal process, frontal process
C. Orbital process, alveolar process
D. Sphenoidal process, horizontal plate (palatine process)
E. Mastoid process, sphenoid process *(incorrect anatomically)*
5. Which of the following are bones of the facial part of the skull?
A. Femur, tibia
B. Parietal bone, frontal bone
C. Zygomatic bone, mandible
D. Pelvis, lower jaw
6. Which bones form the cranial part of the skull?
A. Occipital bone, sphenoid bone
B. Skull, upper jaw
C. Tibia, mandible
D. Pelvis, lower jaw
7. What type of joint is the temporomandibular joint?
A. Complex
B. Simple
C. Compound
D. Combined
8. What is the Latin name for the hyoid bone?
A. Os zygomaticum
B. Os criminale *(incorrect)*

C. Os hyoideum
D. Os parietale
9. In which bone is the maxillary sinus located?
A. Frontal bone
B. Maxilla (upper jaw)
C. Ethmoid bone
D. Mandible
10. What is the Latin name for the ethmoid bone?
A. Maxilla
B. Os frontale
C. Parietale
D. Os ethmoidale
11. How are the bones of the skull connected to each other?
A. Ligaments
B. Cartilage
C. **Sutures**
D. Fibers
12. Which are cranial bones?
A. Parietal, sphenoid, ethmoid
B. Occipital, temporal, zygomatic
C. Temporal, parietal, maxilla
D. Nasal, frontal, palatine
13. Which are cranial bones?
A. Parietal, sphenoid, ethmoid
B. Occipital, temporal, zygomatic
C. Temporal, parietal, maxilla
D. Frontal, nasal, palatine
14. Parts of the occipital bone:
A. Basilar part, squama, lateral parts
B. Sides, body, and shaft
C. Body and sides
D. Side parts
15. Parts of the frontal bone:
A. Squamous part, orbital part, nasal part
B. Part of the optic cup, main part
C. Body, orbital part, nasal part

D. Nose, body

Situational tasks

1. A trauma to the occipital region revealed a fracture in the area of the transverse sinus. Which part of the occipital bone is affected?

A. Left lateral part
B. Right lateral part
C. Squama
D. Basilar part

2. A skull fracture involved the base of the pterygoid process of the sphenoid bone. Which canal's contents may be affected?

A. Tympanic canal
B. Pterygoid canal
C. Musculotubal canal
D. Carotid canal

3. During a competition, an athlete received a blow to the nasal bridge, causing heavy bleeding, swelling, and severe pain on palpation. Which facial bone is most commonly fractured in this region?

A. Ethmoid bone
B. Nasal bone
C. Lacrimal bone
D. Vomer

4. A head injury damaged the posterior sharp angle of the greater wing of the sphenoid bone, resulting in bleeding. Damage to which foramen may have caused the bleeding?

A. Foramen spinosum
B. Foramen rotundum
C. Superior orbital fissure
D. Inferior orbital fissure

5. In severe head injuries, bleeding from the ears is observed. What is the most likely explanation?

A. Fracture of the mastoid process
B. Fracture of the squamous part of the temporal bone
C. Damage to branches of the temporal artery
D. Fracture of the petrous part (pyramid) of the temporal bone

TOPIC: Information about muscles. Structure of facial, masticatory and cervical muscles. Concept of fascia and aponeurosis. Concepts of antagonist and synergist.

Technological model of theoretical lesson

Topic No. __ Time 2 hours (80 minutes)	Number of students ___
Form and type of lesson	A training session to acquire new theoretical knowledge
Lecture plan	1. General information about muscles. 2. Groups and functions of the head muscles. 3. Groups and function of the neck muscles. 4. The concept of fascia and a neurosis . 5. Understanding antagonist and synergist.
Objective: Information about muscles. Structure of facial, masticatory and cervical muscles. Concept of fascia and aponeurosis. Concepts of antagonist and synergist.	
Tasks of the teacher: 1. Gives an idea of the muscles. 2. Provides an understanding of the groups and functions of the muscles of the head. 3. Provides an understanding of the muscle groups and functions of the neck. 4. Provides an understanding of fascia and aponeurosis. 5. Provides the concepts of antagonist and synergist.	Results of educational activities: 1. They will have an understanding of muscles. 2. They will have an understanding of the muscle groups and functions of the head. 3. They will have an understanding of the muscle groups and functions of the neck. 4. They will have an understanding of fascia and aponeurosis. 5. They will have an understanding of antagonist and synergist.
Teaching methods:	Analysis of difficult questions, discussion, brainstorming, methods "Working with small groups", "Z.N.U", "Insert", "Cluster".
Forms of organization of educational activities:	Group and individual work
Teaching aids:	Lecture material, handouts, literature, stand.
Conditions of study:	Study room.
Ways and means of feedback:	Oral and written assessment, presentations, group work.

TECHNOLOGICAL MAP OF THEORETICAL LESSON

No.	Stages of learning	Allocated time	Contents of the lesson	Methods and forms of teaching	Educational resources
1.	Organizational part	2 minutes	The students' uniforms and class preparation are checked. The duty officer provides information on class attendance .	Orally	Magazine, pen
2.	Introduction (Motivation)	3 minutes	Briefly mentions the material of the theoretical lesson related to the topic. Motivation of students aimed at studying the new topic.	Orally	
3.	New topic	4 5 minutes	Objective: to provide students with knowledge of the subject. Topic: Information about muscles. Structure of facial, masticatory and neck muscles. Concept of fascia and aponeurosis. Concepts of antagonist and synergist. Plan 1. Mimic muscles of the head, their functions.	Brainstorming	Board, chalk, notepad, pen, sheet of paper with test questions and basic phrases.

			2. Vital muscles of the head, functions. 3. Neck muscles . 4. Topography.		
4.	Fixing	25 minutes	Control questions are used to expand the level of students' knowledge, increase their ability to develop independent logic, and consolidate a new topic. The methods "Work with small groups", "Z.N.U", "Insert" and "Cluster" consolidate a new topic and activate students.	"Working with small groups", "Z.N.U",	Paper with control questions, testing standards
5.	The final part	5 minutes	The results of the lesson will be announced and the students will be assessed on a 5-point scale. Encourages students who actively participate in the lesson. Homework is assigned at the end of the lesson. Topic: Information about	Discussion	Board, literature, pen, notebook.

			muscles. The structure of the facial, masticatory and cervical muscles. The concept of fascia and aponeurosis. The concepts of antagonist and synergist.		

Tasks for groups.

Group 1.

1. Name the muscles of the head.
2. Create a cluster "Facial muscles".

Group 2.

1. Name the muscles of the neck.
2. Creation of the cluster "Masticatory muscles".

3rd group.

1. Name the hyoid muscles.
2. Create a cluster of "deep neck muscles".

Evaluation criteria (points)

Groups	1 task;	2 task;	Task 3; (0.2 points for each question)			Score amount
	(1,0)	(1,4)	1-question	2-question	3-question	(3.0)
1						
2						
3						
4						

Z.N.U. METHOD

(To control the knowledge gained in lectures and theoretical classes)

Z.N.U. handouts for testing knowledge of the methodology

Concept	I know "+", I don't know "-"	Found out "+", Didn't recognize "-".
Binary nomenclature:		
Muscles and fascia of the head.		
Chewing muscles.		
Facial muscles.		
Superficial muscles of the neck.		
Middle group of neck muscles.		
Suprahyoid muscles .		
Infrahyoid muscles .		
Deep muscles of the neck		

Blitz survey .

1. Chewing muscles?
2. Facial muscles of the head?
3. Superficial muscles of the neck?
4. Deep muscles of the neck?

" Insert Method "

(After the lecture, during theoretical classes, for completing homework and independent work)

Insert is an interactive assessment system for effective reading and thinking that helps in independent study. Lecture topics, books and other materials are assigned to the student in advance. After reading this, " V ; +; -;?" expresses his opinion through signs.

Text Markup System

" V " - confirms what I know.

"+" - new information.

"-" - contrary to what I know.

"?" - I'm interested, I need more information about this.

Insert table

Concepts	V	+	-	?
Masticatory muscles				
Facial muscles				
Circular muscles of the eye.				
Circular muscles of the mouth.				
Muscles surrounding the nose.				
Superficial muscles of the neck .				
Middle group of neck muscles .				
Suprahyoid muscles of the neck .				
Infrahyoid muscles of the neck.				
Deep muscles of the neck.				

Myology is the study of muscles.

Muscles are anatomical structures made up of muscle fibers and capable of contraction. The average muscle mass is 28-45% in adults, 28-32% in women, up to 30% in the elderly, 20-22% in newborns, and up to 50% more in athletes. According to the structure of muscle fibers, they are divided into smooth muscles and striated muscles. Striated muscles are divided into cardiac muscles and skeletal muscles. Smooth muscles are found in the walls of blood vessels, the walls of internal organs (lungs, bronchi, trachea, gastrointestinal tract, urinary organs, and genitals). The transverse muscles include: skeletal muscles, muscles of the oculomotor apparatus, larynx and pharynx, muscles of the soft palate, upper esophagus, and external depressor of the anus.

Each muscle is covered on the outside by a sheath of connective tissue, this sheath is called fascia.

Fascia separates muscles from each other, increasing the lateral pressure when the muscle contracts. Fascia is a sheath that surrounds not only each muscle, but also a group of muscles. Fascia is the structure that allows each muscle to contract separately. In addition to surrounding a single muscle, muscle fascia surrounds a group of synergistic muscles.

Classification of muscles (**Fig. 43**) .

1. According to shape, muscles can be: wide, short, long, deltoid, pyramidal, square, serrated, round and have other shapes.

2. According to the direction of muscle fibers, it is divided into oblique, transverse, straight, and circular muscles.

3. According to their function, muscles are divided into groups of extensor muscles, flexor muscles, abductors, adductors, rotators, supinators, and pronators.

4. Muscles in relation to joints: passing over one joint - single-joint; subdivided into groups of double-joint and multi-joint muscles.

5. According to their location, muscles are divided into medial, lateral, anterior, posterior, superficial, deep, external, and internal groups.

Synergistic muscles are a group of muscles that perform the same task. An antagonist is a group of muscles that perform the opposite function.

(Fig. 43). Types of muscles

(semi-pinnate, pinnate, two-headed, broad, two-ventricle, straight)

Muscle development.

Muscles develop from the middle layer of the embryo — the mesoderm. At 4-5 weeks of embryonic development, the dermatome layer separates from the mesoderm, and the rest of it is called somites. Somites, in turn, are divided into sclerotome and myotome layers. Skeletal bones develop from the sclerotome, and transverse muscles from the myotomes. Myotomes are divided into segmental fragments by the myoseptal barrier. There are 8 pairs of myotomes on the neck of the embryo, 12 pairs in the chest area, 5 pairs in the waist area, 5 pairs in the sacrum area, and 1 pair of myotomes in the coccyx area.

Head muscles.

The muscles of the head are divided into the following groups:

1) facial muscles, chewing muscles;

2) chewing muscles;

3) muscles related to the internal organs (lingual, oculomotor muscles, muscles of the soft palate, muscles of the middle ear).

Chewing muscles.

This muscle group consists of a group of muscles that move the bone of the lower jaw.

Masticatory muscles (Fig. 44) .

1. m . masseter — chewing muscle.

Function: The superficial bundles of the masseter muscle move the lower jaw forward. The intermediate and deep bundles move the lower jaw upward.

2. m . temporalis – temporal muscle.

Function: The posterior bundle of the temporal muscle pulls the lower jaw backward, and the anterior and middle bundles raise the lower jaw.

3. m. p terygoideus lateralis - lateral pterygoid muscle.

Function: With unilateral contraction of the lateral wing muscle, the lower jaw moves in the opposite direction; with bilateral contraction, it ensures forward movement of the lower jaw.

4. **m. pterygoideus medialis** - medial pterygoid muscle.

Function: Directs the lower jaw to the opposite side by unilateral contraction. When it contracts bilaterally, it pulls the lower jaw upward.

The chewing muscles are divided into 3 groups according to their function:

1. elevating: m/masseter, m.temporalis, m . pterygoideus lateris et medialis.

2. bringing the lower jaw forward: m. pterygoideus lateris

3. Muscles that lower the lower jaw - m.geniohyoidea, m.mylohyoidea, m.dugastricus.

Facial muscles . (Fig. 45)

The facial muscles are divided into 2 groups:

The facial muscles of the head include:

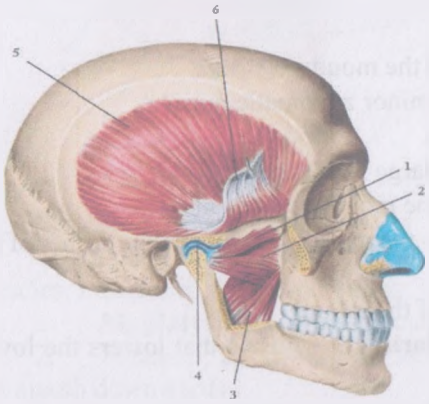
1. M. epicranius is a muscle of the skull. The muscle consists of a) m.occipitofrontalis: b) m. temporaparietalis.

M. occipitofrontalis - there is an occipital part of the muscle - venter occipitalis and an anterior - frontal part - venter frontalis.

Function: The occipital belly compresses the tendon posteriorly, the frontal belly raises the eyebrows and the skin of the forehead.

2. M. m. auriculares anterior, superior et posterior - the upper, anterior and posterior muscles of the auricle - have been preserved in a rudimentary form.

Function: movement of the auricle backward, forward and upward.



(Fig . 44) . **Chewing muscles**
1-m. pterygoideus lateralis (caput superior)
2-m. pterygoideus lateralis (caput inferior)
3- m. pterygoideus medialis
4- articular disc
5- m. temporalis
6- tendin eae . m. temporalis

Facial muscles are divided into 3 groups:

I . Muscles of the eye circumference :

3. **M. orbicularis oculi** - orbicularis oculi muscle.

Function: 1) closes the eye slit; 2) expands the lacrimal sac.

4. **M. corrugator supercilii** – the muscle that wrinkles the eyebrow.

Function: wrinkles the eyebrow.

5. **M. depressor supercilii** – the muscle that lowers the eyebrow.

6. **M. procerus** - the muscle of the proud.

Function: Brings the medial ends of the eyebrows together.

II . Muscles of the nasal circumference:

7. **M. nasalis** – nasal muscle.

Function: narrows the nasal opening and pulls the wings of the nose downward.

8. **M. depressor septi nasi** - a muscle that lowers the nasal septum .

Function: lowers the nasal septum.

III . Muscles of the oral circumference :

9. **M. orbicularis oris** - circular muscle of the mouth.

Function: Closes the mouth slit and pushes the lips forward .

10. **M. levator labi superioris** - the muscle that lifts the upper lip.

Function: lifts the upper lip.

11. **M. levator anguli oris** - a muscle that raises the corner of the mouth.

Function: Raises the corner of the mouth.

12. **M. zygomaticus minor** - minor zygomatic muscle.

Function: Raises the upper lip.

13. **M. zygomaticus major** - large zygomatic muscle.

Function: Pulls the corner of the mouth up and out.

14. **M. depressor anguli oris** - the muscle that lowers the corner of the mouth.

Function: Lowers the corner of the mouth

15. **M. depressor labii inferioris** - the muscle that lowers the lower lip.

Function: Lowers the lower lip.

16. **M. mentalis** - mentalis muscle.

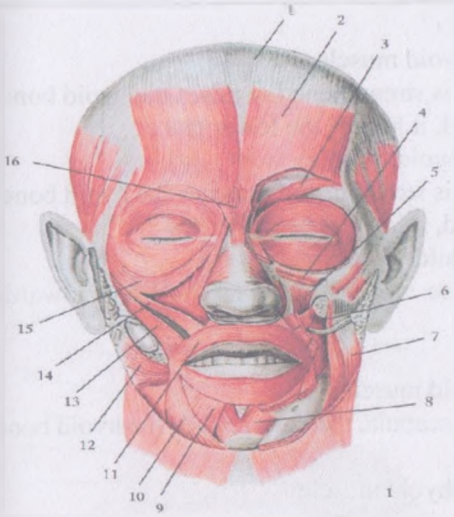
Function: Pulls the lower lip forward and pulls the skin of the chin.

17. **M. risorius - the** muscle of laughter.

Function: pulls the corner of the mouth laterally.

18. **M. buccinator** - cheek muscle.

Function: pulls the corner of the mouth backwards, presses the cheek to the teeth



(Fig. 45). ***Facial muscles of the face***

1-galea aponeurotica
2- m. occipitofrontalis
3- m. corrugator of the brow
4- levator labia superioris muscle
5- m. levator angle of the mouth
6- m. horn
7- masseter muscle
8- mental muscle
9- m. depressor labii inferioris
10- m. depressor angle of mouth
11- orbicularis oris muscle
12- m. risorius
13- zygomaticus major muscle
14- zygomaticus minor muscle
15- orbicularis oculi muscle
16- m. Proc a rus

Muscles of the neck (fig. 46) .

The muscles of the neck are divided into three groups: superficial muscles; muscles of the middle group; deep muscles of the neck.

1. **M. platysma -** subcutaneous muscle of the neck.

2. Function: By pulling the skin of the neck, it pulls the corner of the mouth downwards .

2. **M. sternocleidomastoideus** – sternocleidomastoid muscle. Function **:** with bilateral contraction, it throws the head back; with unilateral contraction, it tilts the head to one side and turns the face to the opposite side

.

Median muscles.

This group of muscles, in turn, is divided into two groups: the suprahyoid muscles and the infrahyoid muscles.

I. Suprahyoid muscles.

1. **M. digastricus** – digastric muscle

Function: with bilateral contraction, the posterior belly pulls the hyoid bone backwards and upwards; with the hyoid bone fixed, it lowers the lower jaw .

2. **M. mylohyoideus** – mylohyoid muscle.

Function: when the lower jaw is strengthened, it raises the hyoid bone; when the hyoid bone is strengthened, it lowers the lower jaw .

3. **M. geniohyoideus** – geniohyoid muscle

Function: when the lower jaw is strengthened, it raises the hyoid bone; when the hyoid bone is strengthened, it lowers the lower jaw .

4. **M. stylohyoideus - stylohyoid** muscle

Function: pulls the hyoid bone upward and backward and towards itself.

II. Infrahyoid muscles

1. **M. omohyoideus -** omohyoid muscle

Function : with a strengthened scapula, the muscle pulls the hyoid bone down and backward .

2. **M. sternohyoideus -** sternohyoid muscle

Function: pulls the hyoid bone downwards.

3. **M. sternothyreoideus** – sternothyroid muscle.

Function: pulls the larynx down .

4. **M. thyreohyoideus -** thyrohyoid muscle.

Function: raises the larynx, lowers the hyoid bone and ensures its stability;

Deep muscle group of the neck.

The deep muscle groups of the neck are located on the anterior surface of the cervical vertebrae, behind the digestive organs, and are divided into medial and lateral groups.

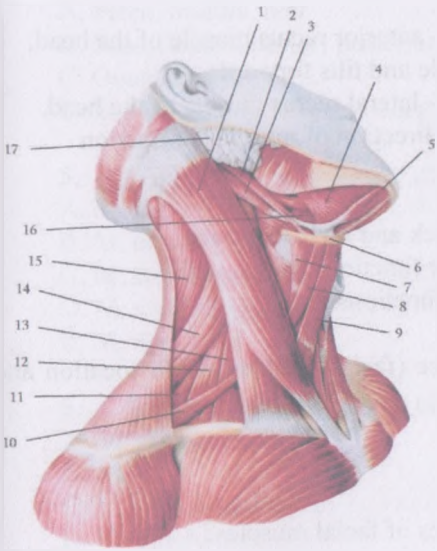
Lateral group: mm scalenus anterior, medius et posterior consist of the anterior, middle and posterior scalene muscles.

Function of the scalene muscles: with a strengthened cervical spine, they lift the 1st and 2nd ribs. With a strengthened chest, they tilt the cervical spine to their side and forward .

Medial group: 1) **M. longus colli** – long muscle of the neck. Function: flexion and extension of the neck.

2) **M. longus capitis** – long muscle of the head

Function: with unilateral contraction, the head bends to the side, and with bilateral contraction, it bends forward.



(Fig . 4 6). Neck muscles

1- M.sternocleidomastoideus
2- M. stylohyoideus
3- M. di gastricus (venter posterior)
4- m. mylohyoideus
5- M. digastricus (front belly)
6- hyoid bone
7- thyrohyoid muscle
8- m. omohyoideus (superior belly)
9- sternohyoid muscle
10- m. omohyoideus (inferior belly)
11- posterior scalene muscle
12- middle scalene muscle
13- anterior scalene muscle
14- m. levator scapulae
15- m. splenius capitis
16- m. hyoglossus
17- parotid gland

(**Fig. 47**) **m. s uboccipitalis -** is located between the 1st and 2nd cervical vertebrae and the occipital bone and consists of the following:

1) **m. obliquus capitis superior** – superior oblique muscle of the head

Function: with unilateral contraction it bends to the side, and with bilateral contraction it pulls back .

2) **m. obliquus capitis inferior** – inferior oblique muscle of the head

Function: turns the head with unilateral contractions.

3) **m. rectus capitis posterior major** – large rectus capitis muscle.

Function: With unilateral contraction it turns to the side, with bilateral contraction it lifts the head.

4) **m. rectus capitis posterior minor** – small rectus capitis muscle.

Function: With unilateral contraction it turns the head, with bilateral contraction it pulls back

5) **M. rectus capitis anterior** – anterior rectus muscle of the head.

Function: Turns head to one side and tilts forward.

6) **M. rectus capitis lateralis** – lateral rectus muscle of the head.

Function: turns the head in the direction of muscle contraction

Current control questions.

1. Superficial muscles of the neck and their functions.
2. Suprahyoid muscles and their functions.
3. Subhyoid muscles and their functions.
4. Deep muscles of the neck.
5. Muscles of the head and face (facial muscles), their location and functions.
6. Chewing muscles.

Test questions

1. What are the characteristics of facial muscles?

A. They stick to the bones
B. They attach to the skin
C. They have different shapes
D. They move bones

2. What parts does the occipitofrontalis muscle consist of?

A. Frontal and occipital bellies
B. Front, back, and middle parts
C. Anterior and posterior bellies and aponeurosis
D. Front, side, and back

3. Where does the masseter muscle originate?

A. From the zygomatic arch
B. From the squama of the temporal bone

C. From the zygomatic process of the temporal bone
D. From the maxilla

4. How are the neck muscles grouped?
A. Front, middle, rear
B. Superficial, anterior, posterior
C. Outer, middle, back
D. Superficial, middle, and deep

5. Which muscle is located above the hyoid bone?
A. M. stylohyoideus
B. M. omohyoideus
C. M. sternohyoideus
D. M. sternothyroideus
E. M. thyrohyoideus

6. Which muscle is located below the hyoid bone?
A. M. digastricus
B. M. stylohyoideus
C. M. mylohyoideus
D. M. omohyoideus
E. M. geniohyoideus

7. Which are chewing muscles?
A. Pterygoid, temporalis, and masseter muscles
B. Temporalis muscle
C. Chewing muscle
D. Orbicularis oris muscle

8. How are the neck muscles classified by relation to the hyoid bone?
A. Connecting with the hyoid bone
B. Muscles attached to anterior and posterior hyoid
C. Muscles attached to medial, lateral, and hyoid bone
D. Superficial, suprahyoid, and infrahyoid muscles

9. Which are superficial neck muscles?
A. M. platysma, m. sternocleidomastoideus
B. M. stylohyoideus, m. sternohyoideus
C. M. scalenus anterior, m. longus colli
D. M. mentalis, m. corrugator supercilii

10. Which are suprahyoid muscles?
A. M. mylohyoideus, m. geniohyoideus
B. M. sternothyroideus, m. omohyoideus
C. M. longus capitis, m. scalenus posterior
D. M. pyramidalis, m. rectus abdominis

11. Which are infrahyoid muscles?
A. M. mylohyoideus, m. geniohyoideus
B. M. trapezius, mm. rhomboidei
C. M. subcostales, m. pyramidalis
D. M. sternothyroideus, m. omohyoideus

12. Specify the deep muscles of the neck:
A. M. mylohyoideus, m. geniohyoideus
B. M. trapezius, mm. rhomboidei
C. M. subcostales, m. pyramidalis
D. M. longus capitis, m. scalenus anterior

13. What is the Latin name for the mylohyoid muscle?
A. M. omohyoideus
B. M. geniohyoideus
C. M. stylohyoideus
D. M. mylohyoideus

14. What is the Latin name for the mental muscle?
A. M. risorius
B. M. procerus
C. M. buccinator
D. M. mentalis

15. Where does the scalene muscle attach?
A. 1st and 2nd ribs
B. 1st rib, thoracic vertebra
C. Thoracic vertebrae, 2nd rib
D. Cervical vertebrae, occipital bone

Situational tasks

1. During surgery to remove a tongue tumor, the surgeon must isolate **m. hyoglossus**, which occupies the entire **Pirogov triangle**. Which structure forms the posterior border of this triangle?

A. M. digastricus (anterior belly)
B. M. genioglossus
C. M. hyoglossus
D. M. digastricus (posterior belly)

2. During dental treatment, the instrument injured the inner cheek, damaging a muscle. Which muscle was most likely affected?

A. M. masseter
B. M. orbicularis oris
C. M. buccinator
D. M. mylohyoideus

3. A victim of electrical trauma to the neck developed a tilt of the head toward the injured side with rotation to the opposite side. Which muscle likely underwent cicatricial changes?

A. M. trapezius
B. M. omohyoideus
C. M. sternocleidomastoideus
D. M. digastricus

4. A 20-year-old patient was diagnosed with a fracture of the **coronoid process** of the mandible with displacement. Which muscle caused the displacement?

A. M. temporalis
B. Lateral pterygoid muscle
C. Medial pterygoid muscle
D. Tensor veli palatini

5. The patient cannot close their eyelids. Damage to which muscle is suspected?

A. M. orbicularis oris
B. M. procerus
C. M. orbicularis oculi
D. M. corrugator supercilii

TOPIC: Structure and functions of the anterior and posterior muscles of the trunk. White line of the abdomen, structure of the inguinal canal.

Technological model theoretical lesson

Topic No. __ time 2 hours (80 minutes)	number of students ___
Form and type of lesson	A lesson on acquiring new knowledge.
Lecture plan on the topic:	1 Back muscles of the trunk, functions. 2. Chest and abdominal muscles, functions. 3. Structure and function of the diaphragm. 4. White line of the abdomen, structure of the inguinal canal .
Objective of the lesson: To develop students' knowledge on the topic " The structure and functions of the anterior and posterior muscles of the body. The white line of the abdomen, the structure of the inguinal canal. "	
Tasks of the teacher: 1. Gives an idea of the back muscles and their functions. 2. Gives an idea of the chest and abdominal muscles and their functions. 3. Provides an understanding of the structure and function of the diaphragm. 4. Gives an idea of the structure of the white line of the abdomen and the inguinal canal.	Results of educational activities: 1. Students will have an understanding of the muscles of the back of the body and their functions. 2. Students will have an understanding of the chest and abdominal muscles and their functions. 3. Students will gain an understanding of the structure of the diaphragm and abdomen. 4. Students will gain an understanding of the linea alba and the structure of the inguinal canal.
Teaching methods:	Analysis of complex issues, discussion, brainstorming, methods "Working with small groups", "Z.N.U", "Insert", "Cluster".
Forms of organization of the educational process:	Work in groups, collectively, individually
aids :	Lecture texts, handouts, literature, stands.
Conditions of study:	Study room
Feedback methods and tools:	Oral and written control, presentations, group work.

TECHNOLOGICAL MAP OF THEORETICAL LESSON

No.	Stages of learning	Allocated time	Contents of the lesson	Methods and forms of teaching	Educational resources
1.	Organizational part	2 minutes	The students' uniforms and class preparation are checked. The duty officer provides information on class attendance .	Orally	Magazine, pen
2.	Introduction (Motivation)	3 minutes	Briefly mentions the material of the theoretical lesson related to the topic. Motivation of students aimed at studying the new topic.	Orally	
3.	New topic	4 5 minutes	Objective: to provide students with knowledge of the subject. Topic: Structure and functions of the anterior and posterior muscles of the trunk. White line of the abdomen, structure of the inguinal canal. Plan 1. The structure of the back muscles, their functions. 2. Structure and functions of the chest muscles. Diaphragm.	Brainstorming	Board, chalk, notepad, pen, sheet of paper with test questions and basic phrases.

			3. Structure and function of the abdominal muscles. 4. White line of the abdomen, inguinal canal.		
4.	Fixing	25 minutes	Control questions are used to expand the level of students' knowledge, increase their ability to develop independent logic, and consolidate a new topic. The methods "Work with small groups", "Z.N.U", "Insert" and "Cluster" consolidate a new topic and activate students.	"Working with small groups", "Z.N.U",	Paper with control questions, testing standards
5.	The final part	5 minutes	The results of the lesson will be announced and the students will be assessed on a 5-point scale. Encourages students who actively participate in the lesson. Homework is given at the end of the lesson. Topic: Structure and functions of	Discussion	Board, literature, pen, notebook.

			the anterior and posterior muscles of the trunk. White line of the abdomen, structure of the inguinal canal.		

Form an answer to the question.

1. Autochthonous muscles of the chest.
2. Superficial muscles of the chest.
3. Chest and abdominal muscles.
4. Superficial muscles of the back.
5. Deep back muscles.
6. Short muscles of the back.

Tasks for groups.

Group 1.

1. Name the autochthonous muscles of the chest.
2. Create a cluster called "Abdominal Muscles".

Group 2.

1. Name the abdominal muscles.
2. Create a cluster "Torso muscles".

Group 3.

1. Name the muscles of the back of the body.
2. Do the "chest muscle" cluster.

Group 4.

1. Name the superficial and deep muscles of the back.
2. Make a cluster "white line of the abdomen".

Evaluation criteria (points)

Group	1 task;	2 task;	Task 3; (0.2 points for each question)			Total points
	(1,0)	(1,4)	1-question	2-question	3-question	(3.0)
1						
2						
3						
4						

Z.N.U. method (to control knowledge gained in lectures and practical classes) **handouts for testing knowledge based on the Z.N.U. method**

concept	I know "+", I don't know "-"	Found out "+", Didn't recognize "-".
Binary nomenclature:		
Autochthonous muscles of the chest		
Chest and abdominal muscles		
Linea alba		
Inguinal canal		
Superficial muscles of the back		
Deep back muscles		
Short back muscles		
Age-related features		

Method "Insert"

(after lectures, practical work, homework)

Insert is an interactive system for assessing effective reading and thinking that helps in independent study. Lecture topics, books and other materials are assigned to the student in advance. After reading this, the student expresses his/her opinion using the signs " V ; +; -; ?".

Text Markup System

" V " - confirms what I know.

"+" - new information.

"-" — information that I don't know.

"?" - made me think. I need more information about this.

Insert tables

Concept	V	+	-	?
Autochthonous muscles of the chest				
Chest and abdominal muscles				
Linea alba				
Inguinal canal				
Superficial muscles of the back				
Deep back muscles				
Short back muscles				

Pectoral muscles.

Depending on development, innervation and function, the pectoral muscles (**Fig. 48**) are divided into the following groups:

1) own or autochthonous muscles of the chest

2) muscles that start from the chest and end on the bones of the shoulder girdle.

Superficial muscles.

1. **m. pecto r alis major** - large pectoral muscle

Function: lowers the raised arm and brings it to the body. With the upper limb strengthened, it raises the ribs and sternum, participating in the expansion of the chest .

2. **m. pectoralis minor** - small pectoral muscle

Function: tilts the scapula forward, and when the shoulder girdle is strengthened, raises the ribs .

3. **m. subclavius** - subclavian muscle

Function: moves the clavicle forward and downward .

4. **m. serratus anterior** - front serrated muscle

Function: ensures the movement of the shoulder blade forward and to the sides, raises the arm upward.

5. **m. m. levatores costarum** – muscle that lifts the ribs. The muscles that lift the ribs consist of two groups:

a) long muscles b) short muscles

Function: rotates the spine to the sides.

Intrinsic (autochthonous) muscles of the chest.

1. m. intercostales externus - external intercostal muscle.

Function: raises the ribs and participates in breathing.

2. m. intercostales internus – internal intercostal muscle,

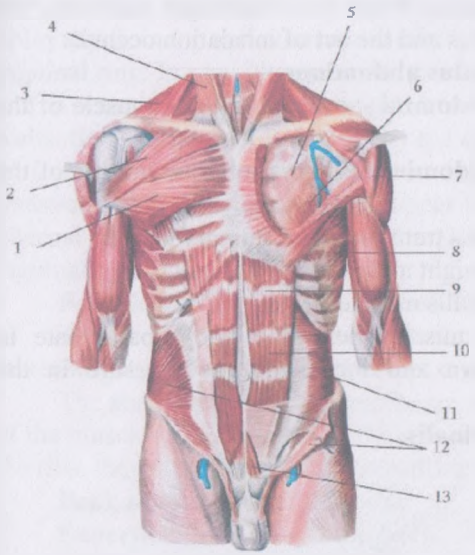
Function: lowers the ribs, participates in exhalation.

3. m . subcostales – subcostal muscles.

Function : brings the ribs closer together, participates in exhalation.

4. m. transversus thoracis - transverse muscle of the chest.

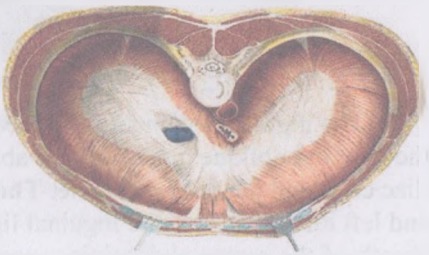
Function: lowers the ribs and participates in exhalation.



(fig . 48). Pectoral muscles.
1-m.pectoralis major (sternocostal part)
2- pectoralis major (clavicular part)
3- trapezius muscle
4- m.sternocleidomastoid
5- pectoral fascia
6- pectoralis minor muscle
7- deltoid muscle
8- serratus anterior
9- tendon intersections
10- rectus abdominis muscle
11- m. transversus abdominis
12- m. internal oblique abdominis
13- pyramidal muscle

Diaphragm - diaphragma.

The anatomical structure that forms a barrier between the chest and abdomen (**Fig. 49**) consists of muscle and serous membrane. The central part of the diaphragm is **a** tendinous center that protrudes into the chest cavity, forming a dome. Around the tendinous center of the diaphragm are muscles that, depending on their location, are divided into three parts. The lumbar part consists of two legs. A gap is formed between these bundles. The aorta and thoracic lymphatic vessels pass through this gap. In front of them, a gap is formed through which the esophagus passes. The costal part of the diaphragm begins from the cartilages of the VII-XII ribs and continues onto the tendinous center. The sternal part of the diaphragm begins from the xiphoid process and continues onto the tendinous center. An opening is formed in the tendinous center of the diaphragm through



which the inferior vena cava passes. When the diaphragm contracts, the volume of the chest cavity increases and the act of inhalation occurs.

Abdominal muscles. Musculus abdominus.

1. **m. obliquus externus abdomini** - external oblique muscle of the abdomen.

2. **m. obliquus internus abdomini** – internal oblique muscle of the abdomen.

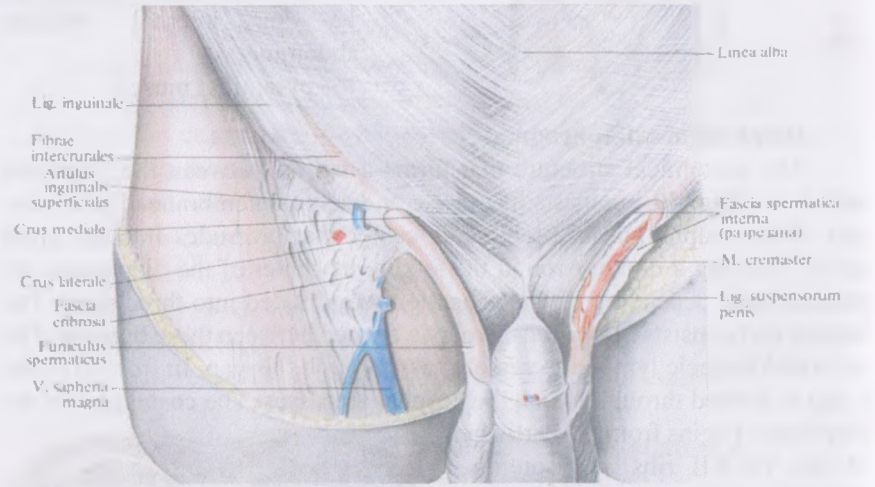
3. **m. transversus abdomini** - transverse abdominal muscle.

4. **m. rectus abdomini** – straight abdominal muscle.

5. **m. pyramidalis** - pyramidalis muscle.

Function: The abdominal muscles bend the body, participate in exhalation, pulling the ribs down and increasing the pressure in the abdominal cavity.

Inguinal canal canalis ingvinalis.



(Fig. 50). Inguinal canal canalis ingvinalis

The inguinal ligament is formed by the bundles of the aponeurosis of the external oblique muscle of the abdomen, attached to the outer lip of the iliac crest and the pubic tubercle. **The inguinal canal** is located on the right and left directly above the inguinal ligament, lateral to the lower part of the sheath of the rectus abdominis muscle. The inguinal canal (**Fig. 50**) is a

narrow slit up to 4-5 cm long, passing through the anterior abdominal wall obliquely from top to bottom and medially from the internal to the superficial inguinal ring. In men, the spermatic cord passes through the inguinal canal, and in women, the round ligament of the uterus. The inguinal canal has 4 walls: the anterior wall is formed by the aponeurosis of the external oblique muscle of the abdomen; the posterior wall is formed by the fascia of the transverse abdominal muscle; the upper wall is formed by the edges of the internal oblique and transverse abdominal muscles; the lower wall is the inguinal ligament.

Function of the abdominal muscles.

As a result of muscle contraction, the abdominal cavity narrows, increasing the pressure on the internal organs.

The abdominal muscles flex the spine and trunk. Unilateral contraction of the muscles tilts the trunk to the side. Since these muscles are attached to the ribs, they also participate in breathing.

Back muscles (Fig.5 1) .

Superficial muscles of the back.

1. **M. trapezius** - trapezius muscle.

A) Descending part of the trapezius muscle

Function: Elevates the shoulder, scapula and rotates the neck to the opposite side.

B) Transverse part of the trapezius muscle.

Function: brings the shoulder blades together and rotates them outward.

B) Ascending part of the trapezius muscle.

Function: pulls the scapula and shoulder downward, rotates the scapula laterally.

2. M. latissumus dorsi – the latissimus dorsi muscle.

Function: rotates the humerus inward and extends it, participates in breathing.

3. **M. rhomboideus major m. romboideus minor** - large and small rhomboid muscles.

Function: Pulls the scapula inward and upward.

4. **M. levator scapulae** - the muscle that lifts the scapula.

Function: This muscle lifts the scapula upward, flexes and rotates the neck.

5. **M. serratus posterior superior** – posterior superior serratus muscle of the back. Function: raises the ribs.

6. **M. serratus posterior inferior** - lower serratus muscle of the back. Function: pulls the ribs down.

7. a) **M. m. intertransversarii anteriores cervicis** – cervical anterior intertransverse muscle.

b) **M. m. intertransversarii posteriores laterales cervicis** - cervical lateral posterior intertransverse muscle.

Function: bends the neck to the sides.

g) **M. m. intertransversarii laterales lumborum** – lumbar lateral intertransverse muscle.

Function: turns the spine (torso) to the side .

d) **M. m. intertransversarii medialis lumborum lumbar medial intertransverse muscle** .

Deep muscle groups of the back.

Musculus spinotransversals is a muscle located between the transverse and spinous processes of the vertebrae.

1. **M. splenus capitus et cervicis** splenial muscle of the head and neck.

Function: With unilateral contraction, it turns the head towards the muscle. With bilateral contraction, it pulls the head back.

2. **M. erector spinae** - a muscle that straightens the spine.

The muscle continues to the occipital bone and is divided into three parts at the point of attachment: a) **m. iliocostalis** - iliac-costal muscle

b) **m. longysimus** - the longest muscle .

v) **m. spinalis – spinal** muscle.

Function: Straightens the spine, pulls the head back and to the side.

3. **m. m. intertransversus posteriores cervicis et lumborum** muscles located between the transverse processes of the spine.

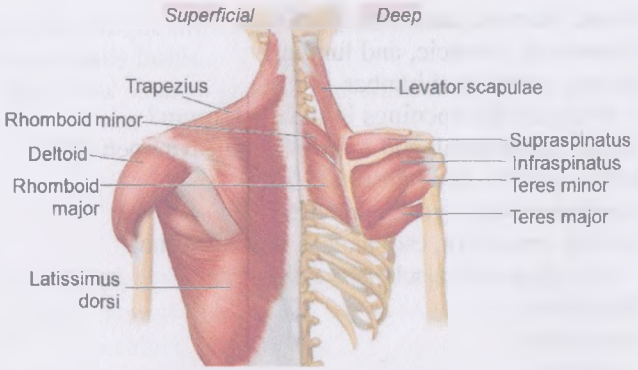
4. **M. transversospinalis** - muscles between the transverse and spinous processes of the vertebrae.

5. **M. m. interspinales** – interspinous muscles.

Function: straightens the spine.

6. **M. m. levatores costarum** – muscles that raise the ribs.

Function: rotates and flexes the spine, lifts the ribs.



(Fig. 51). Back muscles

Among the muscles of the lumbar region there is a triangle - trigonum lumbale.

The lower border of this region is limited by the iliac crest, externally by the external oblique muscle of the abdomen and internally by the latissimus dorsi muscle. The bottom of this triangle is formed by the internal oblique muscle of the abdomen.

Current control questions.

1. What types of muscles are there in the human body?
2. What is the accessory apparatus of skeletal muscles?
3. What do you know about antagonist and synergist muscles?
4. What movements do the muscles of the anterior region of the body perform?
5. What is the function of the muscles of the back of the body?
6. Superficial and deep muscles of the back.
7. Pectoral muscles.
8. Structure and functions of the diaphragm.
9. Abdominal muscles, direction of their muscle fibers.
10. Sheath of the rectus abdominis muscle.
11. Formation of the inguinal canal.

Test questions

1. What parts does the diaphragm consist of?

A. Thoracic, costal, and lumbar

B. Costal, thoracic, and abdominal
C. Abdominal, thoracic, and lumbar
D. Sternal, costal, and lumbar
2. What are the openings in the diaphragm?
A. Aortic, esophageal, and inferior vena cava openings
B. Aortic, gastric, and intestinal
C. Esophageal, laryngeal, and aortic
D. Inferior vena cava, esophageal, and intestinal
3. What type of muscle is the diaphragm?
A. Digestive
B. Respiratory
C. Excretory
D. Output
4. What is the length of the inguinal canal?
A. 6–8 cm
B. 4–7 cm
C. 4–5 cm
D. 2–5 cm
5. What forms the upper wall (roof) of the inguinal canal?
A. External oblique and rectus abdominis muscles
B. Internal oblique and transverse abdominal muscles
C. External oblique and transverse abdominal muscles
D. Rectus abdominis and pyramidalis
6. What forms the lower wall (floor) of the inguinal canal?
A. Inguinal ligament
B. Pectineal ligament
C. Lacunar ligament
D. Round ligament of the uterus
7. What forms the anterior wall of the inguinal canal?
A. Internal oblique muscle of the abdomen
B. Pyramidalis muscle
C. External oblique muscle of the abdomen
D. Rectus abdominis muscle
8. What forms the posterior wall of the inguinal canal?
A. Rectus abdominis muscle
B. Pyramidalis muscle

C. External oblique muscle of the abdomen
D. Transversalis fascia

9. Into how many groups are abdominal muscles divided by location?
A. 5
B. 2
C. 7
D. 3

10. Which are the muscles of the lateral abdominal group?
A. External, internal oblique and transverse abdominal muscles
B. Rectus abdominis, pyramidalis
C. Oblique and rectus muscles
D. External oblique and pyramidalis

11. Which are the superficial muscles of the chest?
A. Pectoralis major and minor muscles
B. Pectoralis major, sternohyoid
C. Serratus anterior, superior serratus
D. Serratus anterior, transversus thoracis

12. Which are the intrinsic (proper) muscles of the thorax?
A. Internal and external intercostal muscles
B. Pectoralis minor, serratus anterior
C. Subclavian, transversus thoracis
D. Levator costarum muscles

13. Which muscles attach to the ribs?
A. Intercostal and subcostal muscles
B. Gluteal muscles
C. Diaphragm and pyramidalis
D. Intercostal and subscapular

14. Which are superficial muscles of the back?
A. Trapezius, latissimus dorsi
B. Rhomboid, buccinator
C. Serratus, pectoralis major
D. Subclavian, brachialis

15. Into which groups are the back muscles divided?
A. Superficial, intermediate, and deep muscles
B. Muscles of the chest, abdomen, and back

C. Anterior, posterior, lateral muscles
D. Medial, lateral, superficial muscles

Situational tasks

1. A young man felt sharp pain in the back after doing pull-ups. Examination revealed pain during adduction, extension, and internal rotation of the shoulder. Which muscle is most likely damaged?
A. M. latissimus dorsi
B. M. levator scapulae
C. M. rhomboideus major
D. M. trapezius

2. After a cerebral hemorrhage, the patient developed paralysis of certain back muscles. Extension of the lumbar spine was impaired. Which muscle is affected?
A. Trapezius
B. Latissimus dorsi
C. Quadratus lumborum
D. Erector spinae (m. erector spinae)

3. Pain occurs during movement of the spine along one side of the trunk. Which muscle is likely inflamed?
A. External oblique muscle
B. Rectus abdominis
C. Quadratus lumborum
D. Transverse abdominal muscle

4. Which muscle lies superficially on the lateral wall of the abdomen?
A. External oblique muscle
B. Rectus abdominis
C. Transverse abdominal muscle
D. Internal oblique muscle

5. Which muscle, when the arms are fixed, lifts the ribs and expands the chest?
A. Pectoralis minor
B. Serratus anterior
C. External intercostal muscles
D. Latissimus dorsi

TOPIC: Structure and functions of the muscles of the shoulder girdle and free upper limb.

Technological model theoretical lesson

Topic No. __ time 2 hours (80 minutes)	number of students ___
Form and type of lesson	A lesson on acquiring new knowledge.
Lecture plan on the topic:	1. The structure of the muscles of the upper limb . 2. Structure and functions of the muscles of the shoulder girdle. 3. Structure and function of the shoulder muscles. 4. Structure and functions of the forearm muscles. 5. Structure and functions of the muscles of the hand .
Objective of the lesson: To develop students' knowledge on the topic "The structure and functions of the muscles of the shoulder girdle and free upper limb ."	
Tasks of the teacher: 1. To give an idea of the structure of the muscles of the upper limb. 2. Provide an idea of the structure and function of the muscles of the shoulder girdle. 3. Provide an idea of the structure and function of the shoulder muscles. 4. Provide an idea of the structure and function of the forearm muscles. 5. Provide an idea of the structure and function of the hand muscles.	Results of educational activities: 1. Students will have an understanding of the structure of the muscles of the upper limb. 2. Students will have an understanding of the structure and functions of the shoulder girdle muscles. 3. Students will have an understanding of the structure and functions of the shoulder muscles. 4. Students will gain an understanding of the structure and functions of the forearm muscles. 5. Students will gain an understanding of the structure and function of the hand muscles.
Teaching methods:	Analysis of complex issues, discussion, brainstorming, methods "Working with small groups", "Z.N.U", "Insert", "Cluster".
Forms of organization of the educational process:	Work in groups, collectively, individually
aids :	Lecture texts, handouts, literature, stands.
Conditions of study:	Study room
Feedback methods and tools:	Oral and written control, presentations, group work.

TECHNOLOGICAL MAP OF THEORETICAL LESSON

Stages of learning	Allocated time	Contents of the lesson	Methods and forms of teaching	Educational resources
Organizational part	2 minutes	The students' uniforms and class preparation are checked. The duty officer provides information on class attendance .	Orally	Magazine, pen
Introduction (Motivation)	3 minutes	Briefly mentions the material of the theoretical lesson related to the topic. Motivation of students aimed at studying the new topic.	Orally	
New topic	4 5 minutes	Objective: to provide students with knowledge on the topic: Structure and functions of the muscles of the shoulder girdle and free upper limb. Plan 1. Structure and functions of the muscles of the shoulder girdle. 2. Structure and function of the shoulder muscles. 3. Structure and functions of the forearm muscles.	Brainstorming	Board, chalk, notepad, pen, sheet of paper with test questions and basic phrases.

		4. Structure and functions of the muscles of the hand .		
Fixing	25 minutes	Control questions are used to expand the level of students' knowledge, increase their ability to develop independent logic, and consolidate a new topic. The methods "Work with small groups", "Z.N.U", "Insert" and "Cluster" consolidate a new topic and activate students.	"Working with small groups", "Z.N.U",	Paper with test questions, testing standards
The final part	5 minutes	The results of the lesson will be announced and the students will be assessed on a 5-point scale. Encourages students who actively participate in the lesson. Homework is given at the end of the lesson. Topic: The structure and functions of the muscles of the shoulder girdle and free upper limb.	Discussion	Board, literature, pen, notebook.

Form an answer to the question.

1. Muscles of the anterior shoulder group.
2. Muscles of the posterior shoulder group.
3. Muscles of the anterior forearm.
4. Muscles of the posterior forearm group.
5. Muscles of the hand.
6. Axillary fossa.
7. Elbow fossa.

Tasks for groups.

Group 1.

1. Muscles of the anterior and posterior shoulder groups.
2. Create a cluster "Anterior forearm muscle group".

Group 2.

1. Anterior group of forearm muscles, their functions.
2. Make a cluster "elbow fossa".

Group 3.

1. What are the functions of the muscles of the posterior forearm?
2. Create a cluster "Anterior and posterior shoulder muscles".

Group 4.

1. Describe the muscles of the hand.
2. Make a cluster "armpit".

Evaluation criteria (points)

Group	1 task;	2 task;	Task 3; (0.2 points for each question)			Total points
	(1,0)	(1.4)	1-question	2-question	3-question	(3.0)
1						
2						
3						
4						

Z.N.U. method

(to control knowledge gained in lectures and practical classes)

Handouts for testing knowledge based on the Z.N.U. method

concept	I know "+", I don't know "-"	Found out "+", Didn't recognize "-".
Binary nomenclature:		
Muscles of the anterior shoulder group		
Muscles of the posterior shoulder group		
Muscles of the anterior forearm		
Muscles of the posterior forearm group		
Muscles of the hand		
Topography of the upper limb		

Method "Insert"

(after lecture, practical work, homework)

Insert is an interactive system for assessing effective reading and thinking that helps in independent study. Lecture topics, books and other materials are assigned to the student in advance. After reading this, the student expresses his/her opinion using the signs " V ; +; -; ?".

Text Markup System

" V " - confirms what I know.

"+" - new information.

"–" — information that I don't know.

"?" - made me think. I need more information about this.

Insert Table

Concepts	V	+	-	?
Posterior shoulder muscles.				
Anterior shoulder muscles.				
Anterior muscles of the forearm.				
Posterior muscles of the forearm.				
Muscles of the hand				
Elbow fossa.				
Axillary fossa.				

Muscles of the shoulder girdle (Fig. 52)

1. **M. deltoideus** - deltoid muscle.

Function: when the anterior fibers are shortened, it flexes the shoulder, when the posterior fibers are shortened, it extends the shoulder joint, when the middle fibers are shortened, it raises the arm to a horizontal level.

2. **M. supraspinatus** – supraspinatus muscle.

Function: Raises the arm to a horizontal level, moves it away from the body and turns it outward.

3. M. infraspinatus – infraspinatus muscle.

Function: outward rotation of the shoulder (supination).

4. **M. teres minor** - small round muscle

Function: outward rotation of the shoulder (supination).

5. **M.teres major** - large teres muscle.

Function: Turns the arm inward, pulling it back and inward.

6. **M. subscapularis** - subscapularis muscle.

Function: Turns the arm inward.

Shoulder muscles.

The shoulder muscles are divided into two groups: the anterior and posterior muscle groups.

Muscles of the anterior shoulder group.

1. **M. biceps brachii** - two-headed muscle of the shoulder.

Function: The long head rotates the shoulder inward and away from the body. The short head brings the shoulder girdle closer to the body, providing flexion at the elbow joint.

2. **M. brachialis** – shoulder muscle.

Function: provides flexion at the elbow joint.

3. **M. corocobrachialis** – coracobrachial muscle.

Function: flexes and adducts the shoulder.

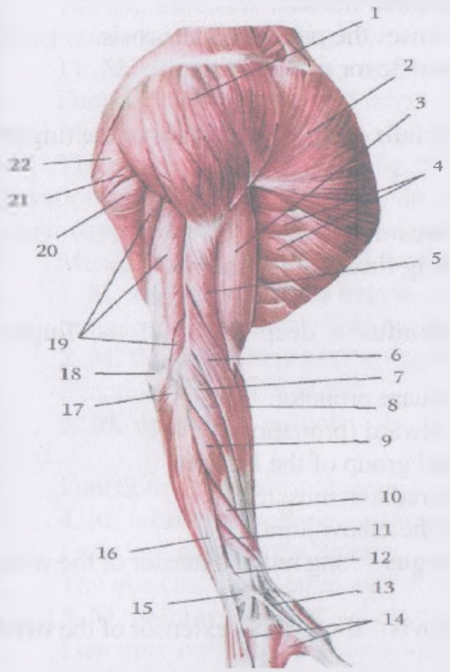
Muscles of the posterior shoulder group.

1. **M. triceps brachii** - three-headed muscle of the shoulder.

Function: extends the shoulder joint, brings it closer, extends the forearm at the elbow joint.

2. **M. anconeus** - elbow muscle.

Function: extends the forearm at the elbow joint.



(Fig . 52). Shoulder muscles
1- m.deltoideus
2- m.pectoralis major
3- m.biceps brachii
4- m.serratus anterior
5- m.brachialis
6- m.brachioradialis
7- m. extensor carpi radialis longus
8- m.flexor carpi radialis
9- m. extensor carpi radialis brevis
10- m. abductor pollicis longus
11- m. extensor pollicis brevis
12- m. extensor pollicis longus
13- anatomical tobacco
14- interosseous muscle
15-extensor retinaculum
16- m. extensor digitorum
17- m. anconeus
18- olecranon
19- triceps brachii muscle
20- m. teres major
21- m. teres minor
22- m . infraspinatus

Forearm muscles.

The muscles of the forearm are divided into the following groups:

1) muscles of the anterior region of the forearm: pronator and flexor muscles.

2) muscles of the posterior group of the forearm: supinators and extensors.

The muscles of the anterior group are the muscles of the superficial layer.

1. **M. pronator teres** – round pronator .

Function: flexes the forearm at the elbow joint, turns it inward.

2. **M. flexor carpi radialis** - radial flexor of the wrist.
Function: Involved in wrist flexion.
3. **M. palmaris longus** - long palmar muscle.
Function: flexes the palm and tenses the palmar aponeurosis.
4. **M.flexor carp ulnaris** – ulnar flexor of the wrist.
Function: Flexes the wrist.
5. **M. flexor digitorum superficialis** – superficial flexor of the fingers.
Function: flexes the II-V fingers.

Deep muscles of the anterior forearm.
6. M. flexor pollicis longus – long flexor of the thumb.
Function: Flexes the thumb.
7. **M. flexor digitorum profundus** – deep flexor of the fingers.
Function: flexes the II-V fingers.
8. **M. pronator quadratus** – square pronator.
Function: Rotates the forearm inward (pronation).
Superficial muscles of the lateral group of the forearm.
1. **M. brachioradialis** - brachioradialis muscle.
Function: flexes the forearm at the elbow joint.
2. **M. extensor carp radials longus** – long radial extensor of the wrist.
Function: extends the wrist.
3. **M. extensor carp radials brevis** – short radial extensor of the wrist.
Function: extends the wrist.
4. **M. extensor digitorum** – extensor of the fingers.
Function: extends fingers.
5. **M. extensor digital minimi** - extensor of the little finger.
Function: extends the little finger.
6. M. extensor carp ulnaris – ulnar extensor of the wrist.
Function: extends the wrist .
Deep muscles of the back of the forearm.
7. **M. supinator** – supinator muscle .
Function: supinates the radius .
8. **M. abductor pollicis longus** - a long muscle that abducts the thumb of the hand .
Function: abducts the thumb .

9. **M. extensor pollicis brevis** - short extensor of the thumb . Function: extends the proximal phalanx of the first finger, abducts it .

10. **M. extensor pollicis longus** - long extensor of the thumb . Function: extends the 1st finger.

11. **M. extensor indicis** - extensor of the index finger .

Function: extends the 2nd finger .

Muscles of the hand.

The muscles of the hand (**Fig. 52**) are divided into the muscles of the elevation of the thumb **(thenar**), the muscles of the elevation of the little finger **(hypothenar),** and the muscles of the middle group .

Muscles of the elevation of the thumb - thenar.

1. **M. abductor pollicis brevis** - a short muscle that abducts the thumb

Function: Abducts the thumb of the hand .

2. **M. flexor pollicis brevis** - short flexor of the thumb .

Function: flexes the thumb .

3. **M. opponens pollicis** - the muscle that opposes the thumb of the hand .

Function: opposes the thumb.

4. **M. adductor pollicis** – a muscle that adducts the thumb of the hand

Function: adducts the thumb .

The muscles of the eminence of the little finger - hypothenar.

5. **M. palmaris brevis** – short palmar muscle .

Function: tightens the palmar aponeurosis.

6. **M. abductor digiti minimi** - muscle that abducts the little finger .

Function: abducts the little finger .

7. **M. flexor digiti minimi brevis** - short flexor of the little finger .

Function: bends the little finger .

8. **M. opponens digiti minimi** - the muscle that opposes the little finger .

Function: opposes the little finger to the first finger.

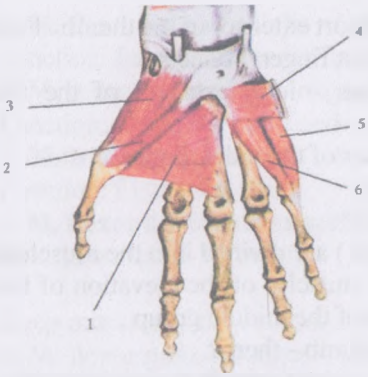
Middle muscle group .

9. **Mm. lumbricalis** - lumbrical muscles .

Function: flex the proximal phalanx, straighten the distal phalanx of the fingers.

10. **Mm . interossei** – interosseous muscles .

Function: abduction and adduction of the II - V fingers.



(Fig . 53). Muscles of the hand
1-m. adductor pollicis
2-m. flexor pollicis brevis
3- m. abductor pollicis brevis
4- m. palmaris brevis
5- m. abductor digiti minimi
6-m. flexor digiti minimi brevis

Current control questions.

1. Muscles of the shoulder girdle.
2. Muscles of the anterior shoulder group and their functions.
3. Muscles of the posterior shoulder group and their functions.
4. Forearm muscles.
5. Muscles of the hand.

Test questions.

1. Which of the following are shoulder muscles?
A. M. masseter, m. pterygoideus medialis
B. M. occipitofrontalis, m. mentalis
C. M. biceps brachii, m. triceps brachii
D. M. biceps brachii, m. occipitofrontalis
2. Into what groups are the forearm muscles divided?
A. Lateral, posterior, deep
B. Medial, deep, superficial
C. Posterior, lateral, medial
D. Anterior, posterior, and lateral
3. To which group does the pronator teres muscle belong?
A. Shoulder muscles
B. Forearm muscles
C. Wrist muscles
D. Chest muscles

4. Identify the superficial muscles of the forearm:
A. M. flexor carpi ulnaris, m. biceps brachii
B. M. pterygoideus medialis, m. levator anguli oris
C. M. longus capitis, m. sternocleidomastoideus
D. M. flexor carpi ulnaris, m. flexor carpi radialis
5. Translate **m. flexor pollicis longus**:
A. Flexor carpi ulnaris
B. Extensor carpi radialis longus
C. Flexor pollicis longus
D. Extensor carpi ulnaris
6. Identify the muscles of the posterior forearm:
A. M. brachioradialis, m. extensor carpi ulnari
B. M. pterygoideus medialis, m. levator anguli oris
C. M. brachialis, m. flexor pollicis longus
D. M. triceps brachii, m. brachialis
7. To which forearm group does **m. supinator** belong?
A. Superficial anterior group
B. Lateral group
C. Deep anterior group
D. Posterior group
8. Where does the deltoid muscle insert?
A. Deltoid tuberosity of the humerus
B. Lesser tubercle of the humerus
C. Medial epicondyle of the humerus
D. Lateral epicondyle of the humerus
9. Which of the following is a muscle of the upper limb girdle?
A. Deltoid
B. Pectoralis major and minor
C. Splenius capitis and splenius cervicis
D. Trapezius
10. Which of the following are shoulder girdle muscles?
A. Teres major and teres minor
B. Pectoralis major and minor
C. Splenius muscles
D. Trapezius

11. Anterior muscle of the shoulder?
A. Biceps brachii
B. Serratus anterior and serratus posterior
C. Teres major, supraspinatus
D. Teres minor and pectoralis major
12. Muscles of the anterior shoulder group:
A. Brachialis muscle
B. Serratus anterior and serratus posterior
C. Teres major, supraspinatus
D. Teres minor and pectoralis major
13. Which of the following is a muscle of the posterior shoulder group?
A. Triceps brachii
B. Supraspinatus and infraspinatus
C. Biceps, triceps, brachialis
D. Teres minor and major
14. Which of the following is a muscle of the posterior shoulder group? *(повтор — можно объединить с 13)*
A. Ulnar muscle of the shoulder
B. Supraspinatus and supraspinatus *(повтор)*
C. Biceps, triceps, brachialis
D. Teres minor and major
15. Muscles of the shoulder girdle?
A. Supraspinatus and infraspinatus
B. Pectoralis major and minor
C. Splenius capitis and cervicis
D. Trapezius, deltoid

Situational tasks

1. A 45-year-old woman injured her upper arm in a car accident. No bone fractures were found, but active extension of the forearm was impossible. Which muscle is likely injured?
A. Triceps brachii
B. Biceps brachii
C. Brachialis

D. Coracobrachialis

2. A radiograph shows a comminuted fracture of the **infraglenoid tubercle** of the scapula. Which muscle tendon is attached here and may be damaged?

A. Lateral head of triceps brachii
B. Long head of biceps brachii
C. Medial head of triceps brachii
D. Long head of triceps brachii

3. A patient with trauma to the greater tubercle of the humerus complains of an inability to rotate the shoulder outward. Which muscles are likely damaged?

A. Subscapularis and coracobrachialis
B. Deltoid and supraspinatus
C. Teres major and teres minor
D. Infraspinatus and teres minor

4. A fracture of the radius occurred below the insertion of the pronator teres. In which direction is the proximal fragment usually displaced?

A. Forward
B. Backward
C. Medially
D. Laterally

5. A 40-year-old man has a cut wound on the dorsum of the right hand near the thumb. The distal phalanx of the thumb cannot be extended. Which muscle is likely injured?

A. Extensor pollicis brevis
B. Extensor pollicis longus
C. Abductor pollicis longus
D. Abductor pollicis brevis

TOPIC: Muscles of the pelvic girdle and muscles of the free lower limb, their functions, groups.

Technological model theoretical lesson

Topic No. __ time 2 hours (80 minutes)	number of students ___
Form and type of lesson	A lesson on acquiring new knowledge.
Lecture plan on the topic:	1. The structure of the muscles of the lower limb . 2. Structure and functions of the pelvic girdle muscles. 3. Structure, groups, functions of the thigh muscles. 4. Structure, groups, functions of the gastrocnemius muscles. 5. Structure and functions of the foot muscles .
Objective of the lesson: To develop students' knowledge on the topic "Muscles of the pelvic girdle of the lower limb (pelvic muscles) and muscles of the free lower limb, their functions, groups."	
Tasks of the teacher: 1. To give an idea of the structure of the muscles of the lower limb. 2. Provide an understanding of the structure and function of the pelvic girdle muscles. 3. Provide an idea of the structure, groups and function of the thigh muscles. 4. Provide an idea of the structure and function of the calf muscles. 5. Provide an idea of the structure and function of the foot muscles.	Results of educational activities: 1. Students will have an understanding of the structure of the muscles of the lower limb. 2. Students will have an understanding of the structure and functions of the pelvic girdle muscles. 3. Students will have an understanding of the structure, group and functions of the thigh muscles. 4. Students will gain an understanding of the structure and functions of the calf muscles. 5. Students will gain an understanding of the structure and function of the muscles of the foot.
Teaching methods:	Analysis of complex issues, discussion, brainstorming, methods "Working with small groups", "Z.N.U", "Insert", "Cluster".
Forms of organization of the educational process:	Work in groups, collectively, individually
aids :	Lecture texts, handouts, literature, stands.
Conditions of study:	Study room
Feedback methods and tools:	Oral and written control, presentations, group work.

TECHNOLOGICAL MAP OF THEORETICAL LESSON

Stages of learning	Allocated time	Contents of the lesson	Methods and forms of teaching	Educational resources
Organizational part	2 minutes	The students' uniforms and class preparation are checked. The duty officer provides information on class attendance .	Orally	Magazine, pen
Introduction (Motivation)	3 minutes	Briefly mentions the material of the theoretical lesson related to the topic. Motivation of students aimed at studying the new topic.	Orally	
New topic	4 5 minutes	Objective: to provide students with knowledge on the topic: Muscles of the lower limb girdle (pelvic muscles) and muscles of the free lower limb, their functions, groups . Plan 1. The structure of the muscles of the lower limb . 2. Structure and functions of the pelvic girdle muscles. 3. Structure, groups, functions of the thigh muscles.	Brainstorming	Board, chalk, notepad, pen, sheet of paper with test questions and basic phrases.

		4. Structure, groups, functions of the gastrocnemius muscles. 5. Structure and functions of the foot muscles .		
Fastening	25 minutes	Control questions are used to expand the level of students' knowledge, increase their ability to develop independent logic, and consolidate a new topic. The methods "Work with small groups", "Z.N.U", "Insert" and "Cluster" consolidate a new topic and activate students.	"Working with small groups", "Z.N.U",	Paper with test questions, testing standards
Concluding part	5 minutes	The results of the lesson will be announced and the students will be assessed on a 5-point scale. Encourages students who actively participate in the lesson. Homework is given at the end of the lesson. Topic: Muscles of the lower limb girdle (pelvic muscles) and muscles of the free lower limb, their functions, groups	Discussion	Board, literature, pen, notebook.

Form an answer to the question.

1. Muscles of the internal pelvic group.
2. Muscles of the external pelvic group.
3. Muscles of the anterior thigh.
4. Muscles of the back of the thigh.
5. Muscles of the medial group of the thigh.
6. Muscles of the anterior group of the lower leg.
7. Muscles of the posterior group of the lower leg.
8. Muscles of the lateral group of the leg.
9. Muscles of the foot.

Tasks for groups.

Group 1.

1. Muscles of the internal and external groups of the pelvis.

2 Form the cluster "Femoral Canal".

Group 2.

1. Name the functions and attachment of the anterior thigh muscles.

2. Create the cluster "Populital Fossa".

3rd group.

1. Functions of the muscles of the back of the thigh.

2. Create a cluster "Muscles of the internal pelvic group".

4 – group.

1. Name the muscles of the foot.

2. Create a cluster "Hamstring muscles".

Evaluation criteria (points)

Group	1 task;	2 task;	Task 3; (0.2 points for each question)			Total points
	(1,0)	(1,4)	1-question	2-question	3-question	(3.0)
1						
2						
3						
4						

Z.N.U. method (to control knowledge gained in lectures and practical classes)

Handouts for testing knowledge based on the Z.N.U. method

concept	I know "+", I don't know "-"	Found out "+", Didn't recognize "-".
Binary nomenclature:		
Muscles of the internal and external pelvic region.		
Muscles of the anterior thigh.		
Muscles of the back of the thigh.		
Muscles of the medial thigh.		
Muscles of the anterior region of the leg.		
Muscles of the back of the leg.		
Muscles of the lateral region of the leg.		
Muscles of the foot.		

Method "Insert"

(after lecture, practical work, homework)

Insert is an interactive system for assessing effective reading and thinking that helps in independent study. Lecture topics, books and other materials are assigned to the student in advance. After reading this, the student expresses his/her opinion using the signs " V ; +; -; ?".

Text Markup System

" V " - confirms what I know.

"+" - new information.

"–" — information that I don't know.

"?" - made me think. I need more information about this.

Insert Table

Concepts	V	+	-	?
Muscles of the internal and external pelvic group.				
Muscles of the anterior thigh.				
Muscles of the back of the thigh.				
Muscles of the medial group of the thigh.				
Muscles of the anterior group of the lower leg.				
Muscles of the posterior group of the lower leg.				
Muscles of the lateral group of the leg.				

Muscles of the pelvic girdle and free lower limb.

I. Internal muscles of the pelvis.

1. **M. iliopsoas** - iliopsoas muscle .

Function: flexion and external rotation of the hip joint.

2. **M. psoas minor** - small lumbar muscle

Function: tenses the fascia of the iliac region and flexes the lumbar region.

II . External muscles of the pelvis (Fig. 54).

1. **M. gluteus maximus** large gluteus muscle .

Function: extends and supinates the thigh.

2. **M. gluteus medius** - gluteus medius muscle .

Function: abducts the hip.

3. **M. gluteus minimus** small gluteal muscle a .

Function: abducts the hip.

4. **M. tensor fasciae latae** - tensor of the broad fascia.

Function: stretches the broad fascia of the thigh, flexes the thigh .

5. **M. p iri formis** - g ruciformis muscle.

Function: supinates the thigh.

6. **M. obturatorius internus** - internal obturator muscle .

Function: supinates the thigh.

7. **M. gemellus superior-** superior gemellus muscle .

Function: supinates the thigh.

8. **M. gemellus inferior** - inferior gemellus muscle .

Function: supinates the thigh.

9. **M. quadratus femoris** – square muscle of the thigh .

Function: supinates the thigh.

10. **M. obturatorius externus** – external obturator muscle

Function: supinates the thigh.

The thigh muscles are divided into three groups:

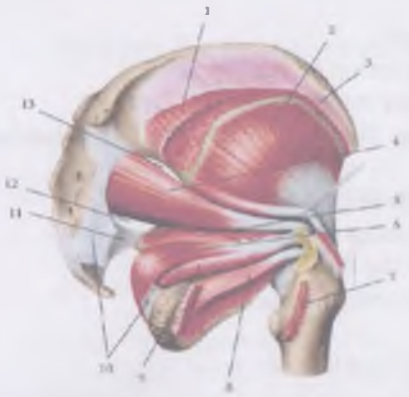
1) muscles of the anterior thigh;

2) internal - medial group of thigh muscles;

3) muscles of the back of the thigh.

Anterior thigh muscles.

I. **M. quadriceps femoris** - quadriceps muscle of the thigh . Each head of this muscle consists of a separate muscle.



(fig . 54) . ***Muscles of the pelvic girdle***

1- gluteus medius muscle
2- m. gluteus minimus
3- gluteal fascia
4- piriformis muscle
5- superior gemellus m.
6- internal obturator muscle
7- quadratus femoris
8- external obturator muscle
9- inferior gemellus m.
10- Sacrotuberous ligament
11- Sacrospinal ligament
12- foramen infra piriformis
13- for. supra piriformis

Thigh muscles (Fig. 55) .

1. **M. rectus** femoris - straight muscle hips .

Function: flexes at the hip joint, extends at the knee joint.

2. **M. vastus lateralis** - lateral broad muscle of the thigh.

Function: flexes the leg at the knee joint.

3. **M. vastus medialis** – medial broad muscle of the thigh.

Function: extends the leg at the knee joint.

4. **M. vastus intermedius** – intermediate vastus muscle of the thigh .

Function: extends the leg at the knee joint.

The tendons of the rectus femoris and the three vasti muscles join together to form the common quadriceps tendon.

Function: extends the leg at the knee joint, the rectus femoris muscle participates in hip flexion.

5. **M. sartorius** - sartorius muscle .

Function: flexes the thigh and leg, abducts and supinates the thigh.

Hamstrings.

1. **M. semitendinosus** - semitendinosus muscle.

Functions: extends the thigh, flexes the leg.

2. **M. semimembranosus** - semimembranosus muscle.

Function: extends the thigh, flexes the leg.

3. **M.biceps femoris** – d vuclavicular muscle of the thigh.

Function: extends the thigh, flexes the leg.

Medial group of thigh muscles .

1. **M. pectineus** - pectineus muscle.

Function: adducts the thigh, flexes and pronates the leg.

2. **M. a d uc t o r long us** - long **adductor** muscle.

Function: adducts the thigh, participates in flexion and supination of the thigh.

3. **M. adductor brevis** - short adductor muscle.

Function: adducts the hip, participates in its flexion .

4. **M. adductor magnus** - large adductor muscle .

Function: adducts the hip, extends the hip.

The pectineus muscle and all the adductor muscles perform the same general function. These muscles adduct the thigh.

5. **M. gracilis** - a thin muscle.

Function: adducts the thigh, flexes the leg.

(Fig.55) . ***Muscles thighs***

1- m. adductor magnus
2- m. semitendinosus
3- adductor canal
4- m. semimembranosus
5- vastus medialis muscle
6- vastoadductor lamina
7- rectus femoris muscle
8- m. adductor longus
9- m. adductor brevis
10- piriformis muscle
11- obturator membrane
12- iliac muscle
13- m.psoas major

Calf muscles.

The muscles of the lower leg are divided into three groups: anterior, posterior and lateral muscles.

Anterior muscles of the lower leg.

1. **M. tibialis anterior** – anterior tibialis muscle .

Function: extends the foot, raising the medial edge.

2. **M. extensor digitorum longus** – long extensor of the fingers.

Function: extends fingers.

3. **M. extensor hallucis longus** – long extensor of the big toe .

Function: extends the big toe .

Lateral muscle group of the leg.

1. M. peroneus longus – long peroneus muscle.

Function: bends the foot and turns it inward.

2. M. peroneus brevis – short peroneal muscle.

Function: bends the foot and turns it inward.

Muscles of the posterior group of the lower leg.

Superficial muscles.

1. **M. triceps surae** - three-headed muscle of the lower leg, consists of the gastrocnemius muscle **m. gastrocnemius** and the soleus muscle **m. soleus** .

M. gastrocnemius – gastrocnemius muscle .

Function: Flexes and rotates the foot outward (supination) and flexes the knee joint.

M. soleus – soleus muscle .

Function: flexes the foot, turns it outward (supination). The triceps tendon attaches to the calcaneal tuberosity. The triceps surae flexes the foot at the ankle joint. Since this muscle originates from the femur, it also provides flexion at the knee joint.

2. **M. plantaris** – plantar muscle .

Function: Performs the same function as the triceps surae muscle.

3. **M. popliteus** – popliteal muscle.

Function: located on the back of the knee joint and is involved in flexion.

Deep muscles

4. **M. flexor digitorum longus** – long flexor of the toes.

Function: bends the toes, flexes the foot and turns it outward.

5. **M. tibialis posterior** - posterior tibial muscle.
Function: flexes the foot at the ankle joint.
6. **M. flexor hallucis longus** - long flexor of the big toe .
Function: flexes the big toe, flexes the foot and turns it outward.
Muscles of the foot.
The muscles of the foot are divided into two groups:
a) muscles located on the dorsal surface of the foot (dorsal).
b) muscles located on the lower (plantar) surface of the foot.
M. extensor digital brevis - short extensor of the toes .
Function: extends the I - IV fingers.
M. extensor hallucis brevis - short extensor of the big toe .
Function: extends the thumb.
Muscles of the sole of the foot.
These muscles, in turn, are divided into internal, external and middle group muscles.
I. Medial muscle group :
1) **M. abductor hallucis** - muscle that abducts the big toe .
Function: abducts the first toe.
2) **M. flexor hallucis brevis** - short flexor of the big toe .
Function : flexes the first toe .
3) **M. adductor hallucis** - the muscle that adducts the big toe
Function : adducts the 1st finger and participates in its flexion.
II . **Lateral group of muscles of the sole of the foot.**
1) **M. a bductor digiti minimi** – muscle that abducts the little toe of the foot.
Function: abducts the little finger.
2) M. **flexor digiti minimi brevis** - short flexor of the little toe . Function: flexes the little toe.
III. Middle group of muscles of the sole of the foot.
1) **M. flexor digitorum brevis** - short flexor of the fingers .
Function: flexes the toes.
2) **M. quadratus plantarae** - square muscle of the sole .
Function: flexes the foot.
3) **M. m. lumbricales** - lumbrical muscles.
Function: flexes the proximal and extends the middle and distal phalanges of the II-V toes, moving them toward the I toe.

4) **M. m. interossei** - interosseous muscles . These muscles are located between the metatarsal bones of the foot. In turn, these muscles are divided into plantar m. interossei plantaris and dorsal m. m . interossei dorsales.

M. m. interossei plantaris - interosseous plantar muscles .

Function: brings fingers 3-5 to the 2nd finger.

M. m. interossei dorsales interosseous dorsal muscles .

Function: Abducts the fingers and flexes the proximal phalanx.

Keywords

Myology is the branch that studies muscles. **Adductio** – ghost. **Abductio** – abduction. **Aponeurosis** – tendons of the broad muscles. **Antagonist** – muscles that perform the opposite task. **Extensio** – extension. **Flexio** – bending. **Fascia** – a layer of connective tissue surrounding muscles. **Myoglobin** – the respiratory pigment of skeletal muscles.

Current control questions.

1. Pelvic muscles and their functions.
2. Thigh muscles and their functions.
3. Calf muscles.
4. Muscles of the foot.

Test questions

1. How many groups are the pelvic muscles divided into?

A. 2
B. 4
C. 5
D. 1
E. 3

2. How are the pelvic muscles classified by their location?

A. External and internal
B. Front and inner
C. Outer and upper
D. Lower and upper
E. Front and lower

3. How are the thigh muscles grouped by location?

A. Anterior, posterior, and medial
B. Front, back, and outer
C. Front, back, and top

D. Front, back, and bottom
E. Front and back
4. Where is the sartorius muscle located?
A. Shoulder
B. Thigh
C. Shin
D. Head
E. Neck
5. Where is the soleus muscle located?
A. Shoulder
B. Hip
C. Shin (posterior compartment)
D. Head
E. Neck
6. What forms the superior border of the femoral triangle?
A. Femoral artery
B. Femoral nerve
C. Sartorius muscle
D. Inguinal ligament
E. Femoral vein
7. Which of the following is a pelvic muscle?
A. M. gluteus maximus
B. M. deltoideus
C. M. brachialis
D. M. tibialis anterior
8. How are the thigh muscles grouped?
A. Anterior, medial, lateral
B. Anterior, medial, posterior
C. Anterior, superficial, deep
D. Superficial, deep, lateral
9. In which region is the sartorius muscle located?
A. Thigh
B. Abdomen
C. Shin
D. Shoulder
10. What does **m. pectineus** mean?

A. Laugh muscle
B. Pectineus muscle
C. Gracilis muscle
D. Elbow muscle

11. How are the muscles of the lower leg (calf) grouped?
A. Front, back, deep
B. Superficial, lateral, posterior
C. Superficial, deep, lateral
D. Front, side, back

12. Which muscles belong to the posterior group of the calf?
A. M. gracilis, m. adductor magnus
B. M. soleus, m. gastrocnemius
C. M. piriformis, m. gluteus medius
D. M. brachialis, m. pectineus

13. What is the Latin name for the soleus muscle?
A. M. piriformis
B. M. sartorius
C. M. gracilis
D. M. soleus

14. What is the function of the hamstring muscles?
A. Extend the thigh and flex the leg
B. Flex the thigh and leg
C. Extend the thigh and leg
D. Extend the leg and adduct the thigh

15. How are the muscles of the foot grouped?
A. Dorsal and plantar
B. External and internal
C. Upper and lower
D. Lower and outer
E. External and upper

Situational tasks

1. A man with a cut wound on the sole of his right foot is unable to elevate the lateral edge of the foot. A tendon injury was found. Which muscle is likely damaged?
A. M. peroneus brevis (short fibular muscle)
B. M. tibialis anterior

C. M. extensor digitorum longus
D. M. triceps surae

2. As a complication of sciatic nerve inflammation, paralysis of the posterior thigh muscles occurred. Which movements became impossible?
A. Hip flexion
B. Knee extension
C. Knee flexion and hip extension
D. External hip rotation

3. After trauma, the patient has swelling on the anterior shin and difficulty with dorsiflexion. Which muscle is impaired?
A. M. tibialis anterior
B. M. flexor digitorum longus
C. M. peroneus brevis
D. M. flexor hallucis longus

4. A basketball player injured his right shin and can no longer plantar flex the foot. Which tendon is likely damaged?
A. M. tibialis anterior
B. M. sartorius
C. Biceps femoris
D. M. triceps surae (gastrocnemius + soleus)

5. An athlete has sciatic nerve compression due to a muscle passing through the greater sciatic foramen. Which muscle caused the compression?

6. A. Psoas major

7. B. Internal obturator

8. C. Piriformis

9. D. Gluteus minimus

Answers to the topical test on anatomy

1 -Topic		2- Theme		3- Theme		4- Theme		5- Topic		6- Topic		7- Topic		8- Topic	
1	A	1	A	1	A	1	D	1	B	1	A	1	C	1	A
2	A	2	B	2	A	2	A	2	A	2	A	2	D	2	A
3	A	3	B	3	A	3	A	3	A	3	B	3	C	3	A
4	E	4	A	4	D	4	A	4	D	4	C	4	D	4	B
5	C	5	A	5	C	5	C	5	A	5	B	5	C	5	C
6	A	6	A	6	D	6	A	6	D	6	A	6	A	6	D
7	C	7	C	7	C	7	A	7	A	7	C	7	C	7	D
8	C	8	C	8	D	8	C	8	D	8	D	8	A	8	B

9	C	9	A	9	D	9	B	9	A	9	D	9	A	9	A
10	D	10	C	10	B	10	D	10	A	10	A	10	A	10	B
11	B	11	B	11	B	11	C	11	D	11	A	11	A	11	D
12	D	12	A	12	A	12	A	12	D	12	A	12	A	12	B
13	B	13	C	13	C	13	A	13	B	13	A	13	A	13	D
14	A	14	B	14	C	14	A	14	B	14	A	14	A	14	A
15	A	15	B	15	C	15	A	15	A	15	A	15	A	15	A

Answers to situational tasks

1 -Topic		2- Theme		3- Theme		4- Theme		5- Topic		6- Topic		7- Topic		8- Topic	
1	B	1	C	1	C	1	C	1	D	1	A	1	A	1	A
2	C	2	D	2	A	2	B	2	C	2	D	2	D	2	C
3	D	3	B	3	B	3	B	3	C	3	C	3	D	3	A
4	A	4	B	4	D	4	A	4	A	4	A	4	B	4	D
5	C	5	B	5	A	5	D	5	C	5	D	5	B	5	C

GLOSSARY

Latin	Russian	Uzbek
Yes	bone	Suyak
Osteology	**Bone Science**	Suyak haqida ta`limot
Compact	Dense	Zich
Nutricium	Nutritious	Oziqlovchi
Skleton	Skeleton	Skeleton
Longum	Long bone	Uzun suyak
On the Plane	Flat bone	Yassi suyak
Vertebra	Vertebra	Umurtqa
Column **vertebralis**	Vertebral column	Umurtqa pog`onas i
Pars	**Part**	**Qism**
Cervicalis	**Cervical**	**Bo`yin**
Thoracalis	**Chest**	**Ko`krak**
Cervicalis	**Cervical**	**Bo`yin**
Sacralis	**Sacral**	**Dumg`aza**
Coccygis	**Coccyx**	**Dum**
Corpus	**Body**	**Tana**
Foramen	**Hole**	**Teshik**
Process	**Shoot**	**You feel**
Articulation	**Joint**	**Bo`g`im**

Superior	**Upper**	**Yuqorigi**
Lower	**Lower**	**Pastki**
Processus articularis **superior**	Upper articular **shoot**	Yuqori bo`g`im **o`simtation**
Processus articularis **lower**	Lower articular **shoot**	Pastki bo`g`im **o`simtation**
Facies	**Surface**	**Use**
Facies articularis **superior**	Upper articular **surface**	Yuqorigi bo`g`im **implementation**
Radix	**Root**	**Ildiz**
Incisors	**Cutout**	Kesma, removed, **o`yma**
Fovea (pit)	**Yama**	**Pit**
Costa	**Rib**	**Qovurg`a**
Medialis	**Medium**	**O`rta**
Lateralis	**Side**	**Yon**
Tuber	**Dombok**	**Do`mboq**
Tuberculum	**Dombokcha**	**Do`mboqcha**
Dens	**Tooth**	**Tish**
Sulcus	**Furrow**	**Egat**
ligamentum collaterale	collateral bundle	Yonlanma boylami
membrane **interosseous**	Interosseous membrane	suyaklararo **parda**
muscle **trapezius**	Trapezoid **muscle**	Trapesiasim **on mushak**
erector muscle **spinae**	Muscle straightening **spine**	Umurtqa pog'onasini to'g'irlovchi **mushak**
pectoralis muscle **major**	Pectoralis major **muscle**	Ka t ta k o` rak **mushagi**
serratus muscle **anterior**	Front serrated **muscle**	Oldingi **tishsimon**
intercostal muscles externally,	External, internal	Tashqi, ichki qovurg'alararo mushak

interni	intercostal **muscles**	
trigonum carotidum	Sleepy **triangle**	Uyqu **uchburchagi**
muscle scalenus	narvonsimon **mushak**	narvonsimon **mushak**
aponeurosis **epicranialis**	Supracranial **aponeurosis**	Call a friend **aponeurosis**
musculus pterygoideus **medialis**	Medial wing-shaped **muscle**	Ichki qanosimon **mushag**
long hair muscles bicipitalis **brachii**	Long Head two-chapter **shoulder muscles**	Yelkani not empty sister **length bosh chassis**
foramen trilaterum	Three-way **hole**	Uch tomonlama **t e shig**
foramen **quadrilaterum**	Four-sided **hole**	To'rt tomonlama **teshig**
pronator muscle teres	Pronator teres	Yumaloq pronator **mushagi**
retinaculum flexorum	Retainer flexors	Ushlab turuvchi bukuvchi
adductor muscle pollicis	Muscle, leading big finger	Bosh barmoqni yaqinlashtiru vchi mushak
lumbar muscles	Vermiformes muscles	Chuvalchang Simon mushak lar
canalis femoralis	Femoral canal	Son of a canal
piriformis muscle	Pear-shaped muscle	Noksimon mushak

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O`QUV ADABIYOTINING NASHR RUXSATNOMASI

Samarqand davlat tibbiyot universitetining 20 25 yil " 2 " may dagi " A/F 201 " - sonli buyrug`iga asosan

Z.M. Mustafoyev

(muallif (lar) sharafi)

Tibbiyot oliy ta'lim muassasalari

(ta'lim yo`nalishi (mutaxassisligi))

ning talabalari (o`quvchilari) uchun tavsiya etilgan

General anatomy of the musculoskeletal system

(o`quv adabiyotining nomi va turi darslik, o`quv qo`llanma)

O'quv qo'llanma

ga

O'zbekiston Respublikasi Sog'liqni saqlash vazirligi Samarqand davlat tibbiyot universiteti tomonidan litsenziya berilgan nashriyotlarda nashr etishga ruxsat berildi.

REKTOR J.RIZAYEV

Ro`yxatga olish raqami

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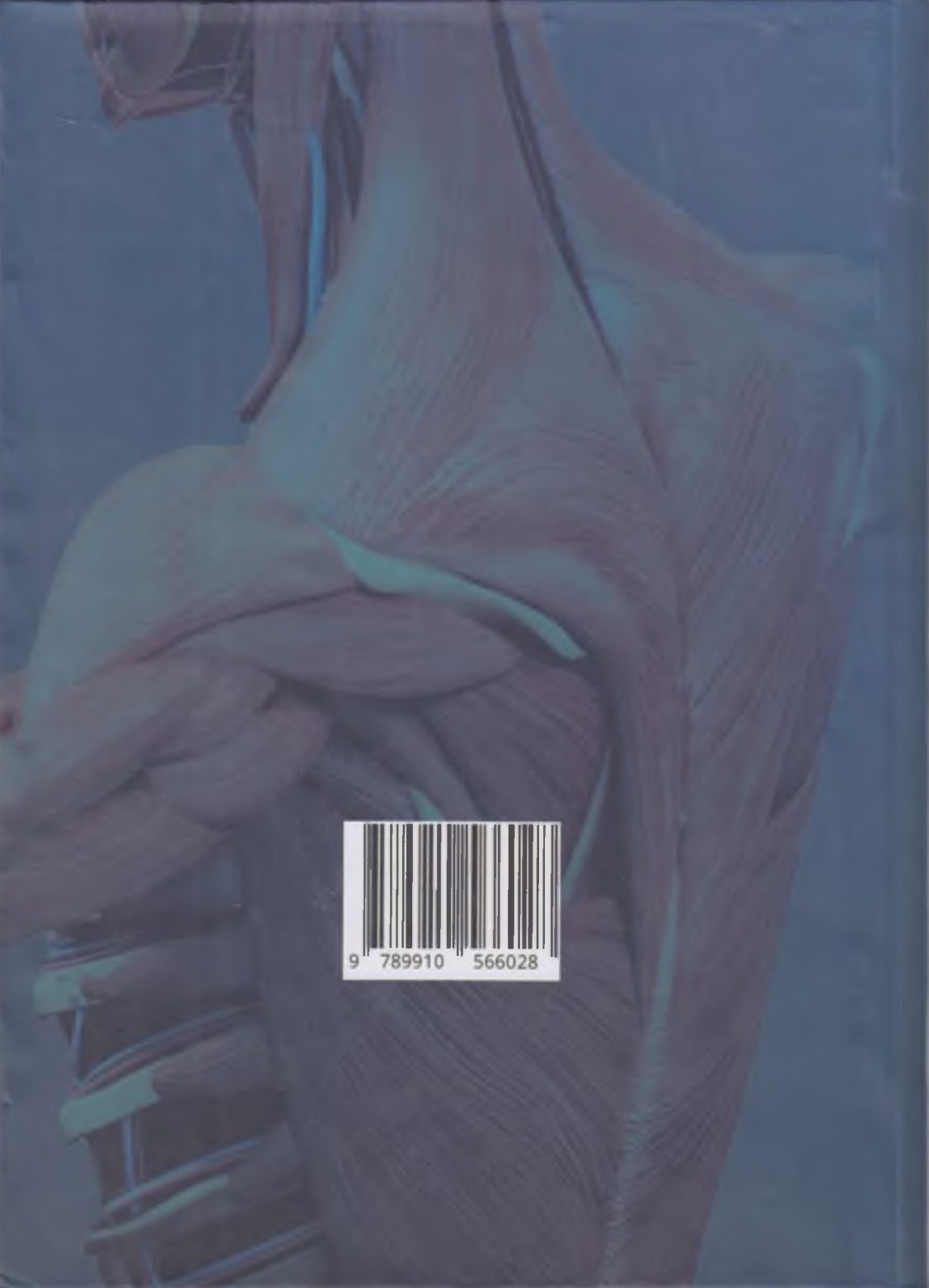
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