

Ministry of Health of the Republic of Belarus
Education Establishment
"Gomel State Medical University"
Normal Physiology Department

It was discussed at the department meeting _____ 30.08.16 _____
The protocol № 8 _____

METHODICAL INSTRUCTION

for carrying out classes by teachers with the 2nd course students
of Faculty for training specialists for foreign countries (teaching in English)
on normal physiology

Topic: Physiology of auditory and vestibular analyzer

The general time of the class – 4 hours

**1. THE STUDYING AND EDUCATIONAL PURPOSES, THE MOTIVATION FOR
ASSIMILATION OF THE SUBJECT, REQUIREMENTS TO THE INITIAL LEVEL OF
KNOWLEDGE**

Motivational characteristic of the subject

The continuous communication of an organism with the external environment providing its adaptation to external influences is carried out by means of analyzers. Knowledge of the general principles of a structure and functions of analyzers, and also knowledge of methods of a research of sensory systems, for the purpose of the qualified comprehension of information value of various indicators providing its adaptive and compensatory reactions are necessary for the medical student.

Purposes of the class

To study structure and functions of auditory, vestibular, proprioceptive, tactile analyzers.

Tasks of the class

To master methods of definition of auditory acuity and binaural hearing; diagnostic Weber's test and Rinne; to be convinced of osteal conduction of sound, of advantage of binaural hearing; to investigate dependence of acoustical sensitivity on sound frequency, to learn to investigate the main proprioceptive and musculocutaneous reflexes.

As a result of carrying out the class the student has to:

To know:

- structure and functions of acoustic analyzer,
- structure and functions of vestibular analyzer,
- muscular and joint reception,
- the conducting ways of analyzers,
- the basic concepts and terms on the class subject.

To be able:

To master methods of definition of auditory acuity and binaural hearing, a diagnostic Weber's test and Rinne, to master methods of research of the main the proprioceptive and musculocutaneous reflexes and to be able to compare the received indicators with norm.

2. CONTROL QUESTIONS FROM RELATED SUBJECTS:

1. Anatomic and general morphofunctional characteristic of acoustical and vestibular analyzers.
2. Muscular and joint reception.

3. The conducting ways of analyzers.

3. CONTROL QUESTIONS ON THE CLASS SUBJECT:

1. Auditory analyzer.

1.1. Structurally functional organization of the auditory analyzer. The sound receptive, sound conducting and sound perceiving devices. The mechanism of transfer of sound vibrations on channels of cochlea.

1.2. Locating and structure of receptor cells of a spiral organ. Mechanisms of acoustical reception. Theories of a perception of a sound (G. Helmholtz and G. Bekesh).

1.3. Conduction and central departments.

1.4. The electric phenomena in cochlea. Biological potentials of cochlea.

1.5. Acoustical feelings. Acoustical sensitivity, tonality volume of sound. Adaptation. Binaural hearing.

2. Vestibular mechanism.

2.1. The features of structure and property of receptor department providing a perception and assessment of position of a body in space and when moving.

2.2 Transfer and information processing in the conducting ways and the central departments of vestibular system. Main afferent ways and projections of vestibular signals. Reactions of an organism to a irritation of vestibular apparatus. Possibilities of their correction.

3. Proprioceptive (muscular and joint) sensitivity.

3.1. Muscular spindles, their participation in formation of a muscle tone and movement.

3.2. Tendinous receptors of Golgi.

Reports:

1. Vestibular reflexes, clinical tests.

2. Hearing disorder pathophysiology.

4. PRACTICAL PART OF THE CLASS

Lab. work 31.1. Binaural hearing definition

Lab. work 31.2. Examination of air and bone conduction of sound.

Lab. work 31.3. Examination of proprioception at the person.

Lab. work 31.4. Tests of the vertical and horizontal writing ("writing" tests).

5. THE COURSE OF THE CLASS

- *Introduction:* The teacher answers questions of students which caused certain difficulties in the course of independent mastering of education material;

- *Demands to the initial level of knowledge:* - From sections of anatomy and histology students have to know anatomy and the general morphofunctional characteristic of acoustical and vestibular analyzers, muscular and joint reception. The carrying-out ways of analyzers.

- *Correction of initial level of knowledge:* The teacher checks and supplements the initial level of knowledge of students of theoretical and applied questions on the class subject "Sensory systems the Acoustic analyzer". The organism receives information on a condition of external and internal mediums by means of sensory systems which are analyzed (distinguish) this information, provide formation of representations and images, and also specific forms of adaptive behavior.

The teacher corrects answers of students on the considered subject;

- *Statement of problems which will be solved by students:* The teacher sets a task to study techniques of definition of a field of vision, air and bone conduction, a research of a proprioception and binaural hearing.

- *Independent performance by students of tasks:*

- students make out the protocol of the class with the subsequent discussion of a technique of performance;

- students perform practical work under control of the teacher and laboratory assistant. For performance of work students are provided with methodical guiding grants and the necessary equipment. Presentation is presented by tables and drawings.

- students read reports on an the class subject with the subsequent discussion.

- *Assessment of final level of knowledge of an the class subject:* The teacher specifies the final level of knowledge of students of theoretical and practical questions, the basic concepts and terms, and also knowledge of basic physiological constants of an the class subject;

- Viewing of the video

- *Fixing of knowledge:* The teacher suggests students to solve several situational problems of a subject of the class and to answer test questions;

- *The conclusion of the teacher and a task to the next the class:* At the end of the class the teacher does the conclusion about the carried-out work and tells students the home task for independent work. Then summing up the class and signing of protocols of experience, and also assessment of practical skills in a leaf of their account is carried out.

Note: time of breaks of 15 minutes during the class.

6. QUESTIONS FOR SELF-CHECKING OF KNOWLEDGE

1. How will hearing change if to close an oval window in the osteal capsule of a cochlea with a rigid membrane?

2. Where is it easier to define the direction of a source of a sound - in air or in water?

3. Can the person hear sounds with a frequency of 40000 Hz? And 5 Hz?

4. The person is affected by a painful stimulus. Whether it is possible, without asking the report on his feelings, to learn that he feels pain?

5. Why don't we feel a ring which we constantly wear on a finger, but distinctly we feel that the fly sat down on the finger?

6. At the person olfactory hallucinations are observed. To what disturbances of functions of area of a cerebral cortex can such changes of a perception be bound with?

7. Why at strong nervousness can gustatory feelings of the person be weakened?

LITERATURE

Basic

1. Human physiology: textbook for overseas students = Физиология человека: учеб. пособие для иностранных студентов, обучающихся на английском языке / А. И. Киеня [и др.]; под ред. проф. Э. С. Питкевича; пер. на англ. яз. Р. А. Карпов, В. А. Мельник. — Гомель: УО ГoГМУ, 2009. — 352 с.

2. Text of lectures.

Alternate

1. Textbook of medical physiology // C. Guyton, 2006. — 1116 p.

2. Human anatomy and physiology // Alexander P., Spence-Elliott B. Masson.

3. Human physiology. The mechanisms of body function // Arthur J. Vander James H Sherman Dorothy S. Luciano, 1986. — 715 p.

4. Lecture notes on human physiology // John J Bray, Patricia A. Cragg, Anthony D.C. Macknight, Roland G. Mills and Douglass W. Taylor.

5. Human anatomy and physiology // Elaine N. Marieb, 1989. — 995 p.

6. Review of medical Physiology, International edition, 2003. — 912 p.