

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 the visual 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

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 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.

Purpose of the class

To study the general principles of structure and functions of analyzers, structure and functions of the visual analyzer.

Tasks of the class

In the course of the class students have to master the technique of definition of visual acuity according to standard tables, definition of a field of vision by means of perimetry technique, be convinced of ability of an eye to accommodation, to be convinced of existence of black spot on a retina.

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

To know:

- general principles of structure and functions of analyzers,
- structure and functions of the visual analyzer,
- methods of research of sensory systems,
- the basic concepts and terms on the class subject.

To be able:

To master the visual acuity definition technique, the technique of perimetry and to be able to compare the received indicators with norm.

2. CONTROL QUESTIONS FROM RELATED SUBJECTS:

1. General morpho-functional characteristic of analyzers.
2. Classification, structure and cytophysiology of receptor cells.
4. Age changes of an eye.

3. CONTROL QUESTIONS ON THE CLASS SUBJECT:

1. A concept about sense organs, analyzers, sensory systems. I. P. Pavlov's doctrine about analyzers. Value of analyzers in development of a brain and in knowledge processes. Classification of sensory systems.

1.1. General principles of structure and main properties of analyzers.

1.2. Main functions of analyzers: detection of signals, differentiation of signals, transfer and transformation of signals, coding, detecting of signals and identification of images.

1.2.1 Types of sensory receptors. Mechanisms of transformation of signals in sensory receptors (primary-sensitive and secondary-sensitive). Receptor and generating potentials.

1.2.2. Differentiation of signals. Absolute and differential thresholds of sensitivity. Adaptation phenomenon.

1.2.3. Conduction department of analyzers and principles of its structure. Features of coding of information (modality, action duration, intensity). Processes of the highest cortical analysis of afferent signals.

2. Visual analyzer.

2.1 Structure of an organ of vision. Optical system of an eye

2.2 Accommodation, its mechanisms. Myopia, hyperopia, their correction.

2.3 Pupil, pupillary reflex, its regulation.

2.4 The receptor device of a retina and photochemical reactions in it at effect of light. Functions of pigment, horizontal, bipolar and ganglionic cells of a retina.

2.5. Electric activity of a retina of an eye – an electroretinogram and its analysis.

2.6 Conduction and central parts of the visual analyzer.

2.7 Color vision. Theories of color perception. Color blindness.

2.8 Visual acuity. Field of vision. Binocular vision.

Reports:

1. Modern ideas of coding and transfer of visual information.

2. Vision illusions, their physiological bases.

3. Interaction of analyzers.

4. PRACTICAL PART OF THE CLASS

Laboratory work 30.1. Definition of acuity of vision.

Laboratory work 30.2. Definition of the visual field (perimeter).

Laboratory work 30.3. Eye accommodation.

Laboratory work 30.4. Definition of the black spot on the retina of the eye (Marriott's experience).

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 anatomy and histology students have to know anatomy and the general morpho-functional characteristic of analyzers. From physics - optical methods of research, mechanical oscillatory and wave processes. From biochemistry – photochemical reactions in the receptor device of a retina.

- *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". Constancy of its internal medium and adaptation to continuously changing environment conditions are necessary for ensuring normal vital activity of an organism. 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;

- *Setting of problems which will be solved by students:* The teacher sets a task to study techniques of definition of visual acuity, definition of color vision, definition of black spot on a retina (Marriott's experience), and also to get acquainted with the contrast phenomenon in the visual analyzer

- *Independent performance of tasks by students:*

- 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 and the necessary equipment. Presentation is provided by tables and drawings.

- students read reports on 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 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. At illumination of an eye with bright light reflex narrowing of a pupil happens. Explain the mechanism of disappearance of a pupillary reflex after an instillation in atropin solution into an eye.

2. What hormone causes mydriasis? Why?

3. Whether the person who lost one eye at young age can restore a perception of remoteness of an object? Why?

4. Dogs have no color vision. But they can differentiate, for example, cards of different color. Due to what abilities?

5. At a research of fields of vision of the patient absence of the left half of fields of vision on both sides is revealed. In what place of a visual tract there is a damage?

6. How will fields of vision change at full damage of the left visual tract?

7. How will vision change at full absence of functions of the field 17 of larger hemispheres cortex? 18 and 19?

8. How will fields of vision change at damage of nervous fibers in the field of a hiazma?

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.