

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: Respiration regulation. Functional methods of research of respiratory system

The general time of the class – 4 hours

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

Purpose of the class

Students have to know the role of receptors, gas structure of the blood and various departments of CNS in respiration regulation.

Motivational characteristic

Assessment of a functional condition of respiration system and cardiovascular system is an important diagnostic indicator. Therefore medical students have to know techniques of assessment of functional condition of these systems.

Tasks of the class

In the course of the class students have to master techniques of assessment of functional condition of respiration system by means of Skibinskaya's index, Stange's and Gench's tests, N. N. Samko's index, and also the technique of measurement of peak rate of an exhalation and to give to the found indicators the corresponding estimates.

As a result of the given class the student has to

To know:

- localization of structures of the respiratory center;
- functional methods of research of respiratory system;
- mechanisms of regulation of respiration system;
- the basic concepts and terms on the class topic;
- basic physiological constants on the class topic.

To be able:

To estimate the functional condition of respiration system by means of Skibinskaya's index, Stange's and Gench's tests, N. N. Samko's index, and also to measure peak rate of an exhalation and to give to the found indicators the corresponding estimates.

2. CONTROL QUESTIONS FROM RELATED SUBJECTS:

1. Localization of structures of the respiratory center.
2. Receptors, their classification and structure.

3. CONTROL QUESTIONS ON THE CLASS TOPIC:

1. Respiratory center. Modern idea of its structure and localization. Humoral regulation of respiration. carbon dioxide role. Receptors of pH, CO₂ and O₂ in an organism, their localization and the role in respiration regulation. Automaticity of the respiratory center and its features. Role of the pneumotoxic center.

2. Reflex self-regulation of respiration. Mechanism of change of respiratory phases. Receptors of lungs, respiratory tracts and respiratory muscles. Participation in the regulation of respiration of mechanoreceptors of lungs (Goering-Breyer's reflexes), irritant receptors, J-receptors, proprioceptors of respiratory muscles, receptors of the upper airways, baroreceptors of aorta and carotid sine. Their physiological value.

3. Periodic of respiration and its regulation. Regulatory influences on the respiratory center from the highest departments of brain (hypothalamus, limbic system, cortex of larger hemispheres). Coordination activity of respiratory and cardiovascular systems.

4. Mechanism of the first inspiration of the newborn, theories.

5. Features of respiration in different conditions.

5.1. Respiration at the lowered atmospheric pressure. Hypoxia, its types. Mountain (altitude) disease. Effective thresholds of hypoxia.

5.2. Respiration at the increased pressure of air. Caisson disease, its mechanism, prophylaxis. Respiration by pure oxygen.

6. Age changes in the system of respiration.

Questions for independent studying:

1. Hypoxia and hyperoxia. A hyperbaric oxygenation, its use in clinic.

Reports:

1. First inspiration of the newborn. Theories.

2. Functional tests in assessment of external respiration, their clinical value.

4. PRACTICAL PART OF THE CLASS

Laboratory work 16.1 Functional breath-holding test.

Laboratory work 16.2 Assessment of the functional condition of respiration system and cardiovascular system by Skibinskaya's index.

Laboratory work 16.3 Definition of physical endurance at the person by calculation of the cardiorespiratory index (in N. N. Samko's modification).

5. THE COURSE OF THE CLASS

- *Introduction*: Students ask the teacher questions which raised certain difficulties in the course of independent development of a training material;

- *Requirement to the initial level of knowledge*: From sections of anatomy and histology students have to know localization of structures of the respiratory center, at home during preparation of control questions students have to give in workbooks the main definitions on a topic.

- *Correction and assessment of level of knowledge*: The student answers on theoretical and applied questions on the class topic "Respiration regulation. Functional methods of research of respiratory system". In this section questions of localization and structure of the respiratory center, the role of gas structure of blood in respiration regulation, and also features of respiration in various conditions are considered. The teacher corrects answers of students on the considered topic;

- students read reports on an class topic with the subsequent their discussion;

- *Statement of problems which will be solved by students*: The teacher sets a task to master techniques of definition of functional state of respiratory and cardiovascular systems at the examinee.

- *Independent performance of tasks by students*:

- students make out the protocol of class in a workbook with the subsequent discussion of techniques of performance;

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

- *Assessment of final level of knowledge of the topic of the class*: 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 topic;

- *Fixing of knowledge*: Students solve situational problems of the topic of the class and answer test questions;

- *The conclusion of the teacher and a task for the next class*: At the end of the class the teacher does the conclusion about the carried-out work, students receive home task for independent work. Summing up is carried out and protocols of experience are signed.

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

6. QUESTIONS FOR SELF-CHECKING OF KNOWLEDGE

1. Road accident at one of victims was resulted by fracture of a spinal cord at the level of 1 - 2 cervical vertebrae? What consequences for respiration will such traumahave?

2. What factors enlarge ventilation of the lungs at physical exercise?

3. Do afferent or efferent fibers of vagus nerve take part in Goering-Breyer's reflexes?

4. On how many seconds is it possible to hold the breath at inspiration without difficulty without special training? a) 180; b) 50; c) 360; d) 20

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.