


<p> ОҢТҰСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		1 p. from 24

METHODOLOGICAL RECOMMENDATIONS FOR PRACTICAL EXERCISES

Discipline: Normal genitourinary system “Physiology”

Discipline code: MSN-2209


Title of OP: 6B10115 “Medicine”

Volume of teaching hours/credits: 150 hours/5 credits (1 credit)

Course and semester of study: 2nd year, 3rd semester

Practical lessons: 8 hours

Shymkent, 2023

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		2 p. from 24


Methodological recommendations for practical classes were developed in accordance with the work program of the discipline Genitourinary system in the norm "Physiology" (syllabus) according to EP 6B10115 "Medicine" and discussed at a meeting of the department

Protocol No. 1 " 01 " 09 2023

Head department, candidate of medical sciences,
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<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		 <p> SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		3 p. from 24

Methodological recommendations No. 1

1. Topic: Excretory functions of the kidneys.

2. Purpose: to study the excretory function of the kidneys, the structure and function of the nephron.

3. Learning objectives: use diagrams, drawings and models to study the structure of the nephron.

4. Main questions of the topic

1. What functions do the kidneys perform?

2. Non-excretory functions of the kidneys.

3. What are the features of the blood circulation of the kidneys.

4. Structure and functions of the nephron.

5. What is primary urine? What is the composition of primary urine?

6. What is final urine? What is the composition of the final urine?

5. Methods of learning and teaching: Discussion of the main issues of the topic, performing practical work, completing test tasks, solving situational problems.

Laboratory work No. 1.

Study of urination in acute experience

For work you need: a stimulator, irritating electrodes for the sciatic nerve, a set of surgical instruments, cannulas for the ureters and femoral vein, syringes for 1, 10 and 20 ml, elastic tubes, silk, cotton wool, napkin, Nembutal, saline solution, 10% NaCl solution, 40% urea solution, 1% methylene blue solution. The object of study is a dog, cat or rabbit.


Carrying out work. The dog is injected with Nembutal solution (50 mg/kg, intraperitoneally) and fixed on the operating table. The abdominal cavity is opened along the midline of the abdomen below the navel. The intestine is moved away and the ureter is found. Two ligatures are placed under the ureter. The ureter is tied with the first ligature and cut below the ligation. Then an incision is made on the ureter through which a cannula is inserted and secured with a second ligature. A cannula is also inserted into the second ureter.

Rubber or other elastic tubes filled with saline are placed over the open ends of the cannulas. The ends of the tubes are brought out through an incision in the abdominal wall and lowered into a glass beaker. A cannula is inserted into the femoral vein and stimulating electrodes are applied to the sciatic nerve. After this, experiments begin.

A cat or rabbit can also be used as experimental animals when studying urine output in an acute experiment. When using a rabbit, the cannula is not inserted into the ureter, but into the bladder, onto which two ligatures are placed closer to the urethra and an incision is made between them.

Task No. 1. Determination of the initial level of diuresis

Half an hour after the end of surgical preparation, the amount of urine excreted in 3 to 5 minutes is determined in animals. This determination is made by counting the droplets

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		4 p. from 24

flowing from the ureters through cannulas and tubes. Drops are counted visually or using special automatic counters.

6. Assessment methods: oral questioning, assessment of practical work, assessment of test tasks and solving situational problems.

7. Literature: see Appendix No. 1.

8. Control

Tests

1. Primary urine is formed... per day.

- a) 50-60 l
- b) 170-180 l
- c) 70-80 l
- d) 90-110 l
- e) 130-160 l

2. Per day, the amount of urine excreted:

- a) 1000-1500 ml
- b) 500-750 ml
- c) 2500-3000 ml
- d) 4000-5000 ml
- e) 5500-6000 ml

3. Quantitative methods for studying kidney function:


- a) Zimnitsky test, determination of filtration, Volhard, electrophysiological
- b) determination of filtration, reabsorption, secretion, electrophysiological
- c) radioisotope, according to Zimnitsky, electrophysiological, Volgard
- d) determination of renal blood flow, secretion, filtration, reabsorption
- e) Volgard, determination of the purification coefficient, secretion, renal plasma flow

4. More acidic urine is formed after:

- a) eating vegetarian food, physical activity
- b) intake of dairy-vegetable foods, intake of water
- c) significant physical activity, eating meat
- d) eating salty foods, fruit juices
- e) physical activity, eating fruits

5. At night there is a decrease in diuresis. Give possible reasons

- a) the activity of the cerebral cortex decreases
- b) the tone of the hypothalamic centers of sleep and wakefulness decreases
- c) the intensity of metabolic processes decreases
- d) blood pressure decreases, helping to reduce the formation of primary urine and reduce diuresis
- e) blood pressure decreases, promoting an increase in the formation of primary urine and a decrease in diuresis

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		 <p> SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 B
Methodological recommendations for practical classes in the discipline "Physiology"		5 p. from 24

6. The anatomical features of blood circulation in the glomerulus are such that the afferent artery has a larger diameter than the efferent one. Let's imagine the opposite relationship - the afferent artery has become narrower than the efferent artery. Wherein:

- the hydrostatic pressure of the filtrate in the capsule increases
- the hydrostatic pressure of blood in the glomerulus of capillaries decreases, promoting an increase in filtration
- the hydrostatic pressure of blood in the glomerulus of capillaries decreases, helping to reduce filtration pressure
- hydrostatic blood pressure in the glomerulus of capillaries increases, helping to reduce filtration pressure
- the hydrostatic pressure of blood in the glomerulus of capillaries increases, contributing to an increase in filtration pressure

Situational tasks:

- A person's blood pressure dropped to 50 mmHg. Will this change the amount of urine produced?
- How will diuresis and urine osmolarity change when water intake into the body is limited? Explain the mechanism of these changes.

Methodical recommendations No. 2

1. Topic: Processes of urine formation.

2. Purpose: to study the basic processes of urine formation, the composition of final urine, to give an understanding of the mechanisms of urine formation and urination.

3. Learning objectives: using manuals, diagrams and models to study the processes of filtration, reabsorption and secretion, urinary processes.


4. Main questions of the topic

- Structural and functional unit of the kidney.
- The process of glomerular ultrafiltration.
- What is the filtration pressure?
- The process of tubular reabsorption. What substances are reabsorbed in the kidneys.
- The process of tubular secretion. What substances are secreted in the kidneys.
- Which substances are threshold.
- What is obligate and facultative reabsorption.
- Composition of primary urine.
- Composition of final urine.

5. Methods of learning and teaching: Discussion of the main issues of the topic, performing practical work, completing test tasks, solving situational problems.

Laboratory work No. 1.

Analysis of urograms

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		6 p. from 24

The content of the work. 1. Give a conclusion on each of the urograms: indicate the most obvious differences compared to the norm.

2. Indicate which stages of urine formation are impaired and in what way.

3. Try to use “Additional Data” to assess the possible causes of disturbances in urinary processes.

Urogram No. 1


Diuresis	800ml
Relative density	1.023
Color	Pale yellow
Transparency	Muddy
Reaction	Slightly alkaline
Protein	1g/l
Glucose	No
Ketone bodies	No
Microscopy of sediment: erythrocytes, including leached ones, 40–50 per field of view, single hyaline and erythrocyte casts.	
Additional data: blood pressure – 165/105 mm Hg, residual blood nitrogen 50 mg% (32.4 μ mol/l).	

Urogram No. 2

Diuresis	2800ml
Relative density	1.009
Color	light yellow
Transparency	full
Reaction	Slightly acidic
Protein	2g/l
Glucose	No
Ketone bodies	No
Microscopy of sediment: single in the field of view, leached hyaline erythrocytes and cylinders.	
Additional data: blood pressure – 185/100 mm Hg, residual blood nitrogen 80 mg% (47.0 μ mol/l).	

Urogram No. 3

Diuresis	420ml
Relative density	1.011
Color	deep yellow
Transparency	cloudy
Reaction	sour
Protein	2g/l

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		7 p. from 24

Glucose	No
Ketone bodies	No
Microscopy of sediment: single in the field of view, leached hyaline erythrocytes and cylinders. Additional data: blood pressure – 175/100 mm Hg, residual blood nitrogen 190 mg% (130 μ mol/l).	

Urogram No. 4


Diuresis	1000ml
Relative density	1.037
Color	straw yellow
Transparency	incomplete
Reaction	alkaline
Protein	33g/l
Glucose	No
Ketone bodies	No
Microscopy of sediment: granular and waxy cylinders in large quantities. Additional data: blood pressure – 120/65 mm Hg, residual blood nitrogen 35 mg%	

Urogram No. 5

Diuresis	1900ml
Relative density	1.025
Color	Pale yellow
Transparency	full
Reaction	main
Protein	No
Glucose	2.5%
Ketone bodies	No
Additional data: blood glucose 3.8 mmol/l.	

Urogram No. 6

Diuresis	5500ml
Relative density	1,040
Color	Pale yellow
Transparency	full
Reaction	neutral
Protein	No
Glucose	4%
Ketone bodies	Positive reaction
Additional data: blood glucose 18 mmol/l. Total body weight is 50% higher than	

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		8 p. from 24

normal

6. Assessment methods: oral questioning, assessment of practical work, assessment of test tasks, assessment of solutions to situational problems.

7. Literature: see Appendix No. 1.

8. Control

Tests

1. The normal glomerular filtration rate in women is:

- a) 50 ml/min
- b) 80 ml/min
- c) 135 ml/min
- d) 110 ml/min
- e) 150 ml/min

2. In the loop of Henle the following is reabsorbed:

- a) potassium sodium
- b) sodium glucose
- c) urea water
- d) water sodium
- e) sodium water

3. Water reabsorption is ensured by the hormone:

- a) antidiuretic hormone
- b) glucagon
- c) somatotropin
- d) parathyroid hormone
- e) insulin

4. Secondary urine differs from primary urine in that it contains:


- a) no glucose, urea, high concentration of sulfates
- b) no glucose, proteins, high concentration of sulfates
- c) no glucose, creatine, low sulfate concentration
- d) high concentration of salts, low concentration of glucose and sulfates
- e) globulins and penicillin appear, the concentration of phosphates is reduced

5. Non-threshold substances include:

- a) creatinine, glucose, inulin
- b) creatinine, inulin, sulfates
- c) creatinine, glucose, sulfates
- d) creatinine, inulin, phosphates
- e) amino acids, inulin, water

6. Urine formation is based on three main processes:

- a) glomerular filtration, tubular reabsorption and secretion

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		9 p. from 24

- b) glomerular reabsorption, tubular filtration and secretion
- c) glomerular secretion, tubular reabsorption and filtration
- d) glomerular secretion and filtration, tubular reabsorption
- e) glomerular reabsorption and secretion, tubular filtration

7. Usually the occurrence of a pathological process is accompanied by the appearance of protein in the urine. Explain the reason

- a) increase in oncotic pressure of plasma proteins
- b) decrease in oncotic pressure of plasma proteins
- c) protein diet
- d) positive nitrogen balance
- e) loosening the filter membrane

Situational tasks:

1. The hydrostatic pressure of blood in the capillaries of the glomeruli is 70 mmHg, the oncotic pressure of the blood plasma is approximately 30 mmHg, the hydrostatic pressure of the filtrate filling the capsule is 10 mmHg. What is the pressure that ensures glomerular filtration?
2. The outflow of urine from the nephron is difficult. How will this change? glomerular filtration and why?

Methodical recommendations No. 3

1. Topic: Regulation of urine formation processes.

2. Purpose: to study the mechanisms of nervous and humoral regulation of urine formation.

3. Learning objectives: using manuals, diagrams and models, study the processes of regulation of urine formation.


4. Main questions of the topic

1. Humoral regulation of urine formation and excretion.
2. Nervous regulation of urine formation and excretion.
3. Unconditioned reflex processes of urination.
4. Conditioned reflex processes of urination.
5. In which part of the spinal cord is the center of urination located?

5. Methods of learning and teaching: discussing the main issues of the topic, performing practical work, completing test tasks, solving situational problems

Laboratory work 1. Study of urination in acute experience

To work you need: stimulator, irritating electrodes for the sciatic nerve, a set of surgical instruments, cannulas for the ureters and femoral vein, syringes for 1, 10 and 20 ml, elastic tubes, silk, cotton wool, napkin, Nembutal, saline solution, 10% NaCl solution, 40 % urea solution, 1% methylene blue solution. The object of study is a dog, cat or rabbit.

ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ		 SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия»
Department of Morphophysiology		044-53/19-12 B
Methodological recommendations for practical classes in the discipline "Physiology"		10 p. from 24

Carrying out work. The dog is injected with Nembutal solution (50 mg/kg, intraperitoneally) and fixed on the operating table. The abdominal cavity is opened along the midline of the abdomen below the navel. The intestine is moved away and the ureter is found. Two ligatures are placed under the ureter. The ureter is tied with the first ligature and cut below the ligation.

Then an incision is made on the ureter through which a cannula is inserted and secured with a second ligature. A cannula is also inserted into the second ureter. Rubber or other elastic tubes filled with saline are placed over the open ends of the cannulas. The ends of the tubes are brought out through an incision in the abdominal wall and lowered into a glass beaker. A cannula is inserted into the femoral vein and stimulating electrodes are applied to the sciatic nerve. After this, experiments begin.

A cat or rabbit can also be used as experimental animals when studying urine output in an acute experiment. When using a rabbit, the cannula is not inserted into the ureter, but into the bladder, onto which two ligatures are placed closer to the urethra and an incision is made between them.

Task 1. Effect of hypertonic NaCl solution on diuresis

10 -15 ml of a 10% NaCl solution is injected into the femoral vein (through a cannula) and after a while the amount of urine excreted is determined.

Task 2. Effect on urea diuresis

When diuresis after the experiment (task 2) has approached the initial level, 5 ml of a 40% urea solution is injected into the femoral vein. At the same time, an increase in diuresis occurs again.

Task 3. Excretion of methylene blue by the kidneys

3 ml of a 1% solution of methylene blue is injected into the femoral vein and after some time (2 - 3 minutes) the release of colored urine is observed.

Task 4. Effect of sciatic nerve irritation on diuresis

Having determined the change in diuresis under the influence of urea, irritation is applied to the sciatic nerve. Under the influence of painful stimulation, diuresis sharply decreases (reflex oliguria) or stops (reflex anuria).

6. Assessment methods: oral questioning, assessment of practical work, assessment of test tasks, assessment of solutions to situational problems


7. Literature: see Appendix No. 1.

8. Control

Tests

1. Stimulate the formation of ADH:

- an increase in blood volume and osmotic pressure, an increase ambient temperature
- increase in blood pressure, air temperature and decrease in osmotic blood pressure
- a decrease in blood volume and an increase in its osmotic pressure,

<p> ОҢТҰСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		11 p. from 24

increase in air temperature

d) decrease in blood pressure, air temperature and decrease in osmotic blood pressure

e) decrease in blood temperature and increase in its osmotic pressure

2. Homeostatic renal function

a) excretion of end products of nitrogen metabolism

b) synthesis of substances with hormonal effects

c) maintaining blood pressure

d) metabolism of proteins, fats, carbohydrates

e) regulation of leukopoiesis

3. The reason why physiological oliguria occurs

a) severe sweating during temperature reactions

b) the presence of stones and tumors in the urinary tract

c) loss of fluid through sweat in hot weather

d) profuse diarrhea

e) uncontrollable vomiting

4. The blood pressure in the capillaries of the glomerulus was 70 mmHg, the oncotic pressure of the blood was 30 mmHg, the pressure in the capsule was 20 mmHg.

Calculate filtration pressure (mmHg)

a) 50

b) 40

c) 30

d) 20

e) 10

5. A significant decrease in diuresis was caused in the experimental animal. At the same time, it was established that his blood has a vasoconstrictor effect. Which of the following hormones has this dual effect?

a) adrenaline

b) aldosterone

c) somatotropic

d) natriuretic

e) antidiuretic


6. In a healthy newborn child, the frequency of urination reaches 15-20 times a day. The specific gravity of urine reaches 1.004-1.008. Since the child is healthy, these features should be associated with a deficiency of some mechanism in the newborn. Which one exactly?

a) imperfection of the reabsorption mechanism

b) insufficient production of ADH

c) incomplete kidney development

d) small size of nephrons

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		 <p> SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 B
Methodological recommendations for practical classes in the discipline "Physiology"		12 p. from 24

e) low level of glomerular filtration

Situational tasks:

1. When the blood supply to the kidney deteriorates, the blood pressure level increases. What is the mechanism of such hypertension.
2. Why can the activity of a transplanted kidney change under the influence of stimuli acting on the nervous system, just like the activity of a normal innervated kidney?
3. In the experiment, a solution of sodium chloride was injected into the blood of two dogs. In response, the following changes in diuresis and natriuresis developed: in the first dog, both diuresis and natriuresis increased; in the second, natriuresis increased and diuresis decreased. What concentrations of sodium chloride solutions were introduced in the first and second cases?

Methodological recommendation No. 4

1. Topic: Thermoregulation. Sweating.

2. Purpose: to study the physiological basis of thermoregulation.

3. Learning objectives: know the meaning of thermoregulation, determine body temperature, explain the mechanisms of heat production and heat transfer

4. Main questions of the topic:

1. Constancy of the temperature of the internal environment of the body.
2. Daily fluctuations in human temperature.
3. Thermoregulation, concept, types.
4. Heat production: metabolism as a source of heat production.
5. The role of organs and tissues in heat production.
6. Heat dissipation; types and regulation.
7. Thermoreception. Peripheral, deep cold and heat thermoreceptors.
8. Thermoregulation at high and low ambient temperatures.

5. Methods of learning and teaching: discussion of the main issues of the topic, performing practical work, completing test tasks, solving situational problems.

Laboratory work No. 1

Thermometry

Typically, body temperature is measured 2 times a day (at 7-9 a.m. and at 5-7 p.m.). As a rule, systematically measuring body temperature 2 times a day makes it possible to get an idea of its daily fluctuations.

Body temperature can be measured in different ways:

in the armpit: 36.3-36.90 C

in the inguinal fold: 37.00 C


in the oral cavity: 36.8-37.30 C

in the ear canal: 37.5-37.70 C

in the rectum: 37.3-37.70 C

in the vagina: 36.7-37.50 C

Thermometry has great diagnostic value.

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 B
Methodological recommendations for practical classes in the discipline "Physiology"		13 p. from 24

Laboratory work No. 2

Adaptation of skin temperature receptors to high and low temperatures.

Water at temperatures of 10, 25 and 40° C is poured into three containers. The hand of the test subject's right hand is placed in a container with water at a temperature of 10° C, the left hand - at a temperature of 40° C. The adaptation time of thermoreceptors is determined, i.e. the time during in which the sensation of heat or cold weakens. Then both hands are simultaneously transferred into a vessel with water at a temperature of 25 ° C. The subject reports a change in sensations in the left and right hands (the phenomenon of contrast). The results obtained are entered into a table and a conclusion is drawn.

object	Feeling when immersed in water		
	10 C	25 C	40 C
right hand	cold	warm	
left hand		cold	warm

a) There is a phenomenon of contrasting sensations in the left and right hands, which is caused by the adaptation of receptors to cold or heat stimulation

6. Assessment methods: oral questioning, assessment of practical work, assessment of test tasks, assessment of solutions to situational problems.

7. Literature: see Appendix No. 1.

8. Control

Tests

1. The center of thermoregulation is located in...


- a) hypothalamus.
- b) medulla oblongata.
- c) midbrain.
- d) pons.
- e) thalamus

2. Heat production is enhanced by the hormone....

- a) thyroxine
- b) insulin
- c) glucagon
- d) mineralocorticoid
- e) parathyroid hormone

3. When the temperature of the external environment increases, in homeothermic animals, ... heat production ... heat transfer

- a) decreases increases

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		14 p. from 24

- b) increases decreases
 - c) decreases decreases
 - d) increases increases
 - e) increases remains constant
4. Chemical thermoregulation includes processes
- a) changes in metabolic rate
 - b) heat conduction
 - c) thermal radiation
 - d) convection
 - e) evaporation
5. We call isothermia:
- a) increased body temperature
 - b) not constant body temperature
 - c) constancy of body temperature
 - d) metabolism
 - e) decrease in body temperature
6. We call hyperthermia:
- a) increased body temperature
 - b) not constant body temperature
 - c) constancy of body temperature
 - d) metabolism
 - e) decrease in body temperature
7. Heat balance is:
- a) Heat production during metabolism
 - b) Heat dissipation into the surrounding area
 - c) Violation of the thermoregulation mechanism
 - d) Stationary state of heat exchange with the external environment without changing the heat content in the body
 - e) Exchange of thermal energy of the body with the external environment
8. Which process provides the greatest heat output
- a) non-contractile thermogenesis
 - b) contractile thermogenesis
 - c) chemical thermoregulation
 - d) vasodilation of blood vessels
 - e) muscle relaxation
9. ... the structures of the hypothalamus regulate the amount of heat production
- a) front
 - b) average
 - c) rear
 - d) rear and front

<p> ОҢТҰСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p> SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
<p>Department of Morphophysiology</p>		<p>044-53/19-12 B</p>
<p>Methodological recommendations for practical classes in the discipline "Physiology"</p>		<p>15 p. from 24</p>

e) middle and front

10. With artificial (medical) hypothermia, body temperature decreases to 30 ° C. In this condition in the body:

- A) Oxygen consumption increases to compensate for cooling
 - B) Oxygen consumption decreases and tissue resistance to oxygen deficiency increases
 - C) The excitability of nervous and muscle tissue increases
 - D) Heart rate increases
 - E) The tone of the sympathetic nervous system increases
11. Contractile thermogenesis is primarily associated with:
- A) With changes in tone and physical contractions of skeletal muscles
 - B) With a change in the activity of smooth muscles of the gastrointestinal tract
 - C) With skin blood flow
 - D) With the work of the respiratory muscles
 - E) With the work of internal organs

Situational tasks:

1. An accident happened: a man fell into an ice hole. He was soon pulled out. As first aid, a mustard bath was prescribed at a temperature of 40C. Explain the purpose and mechanism of this procedure.

Topic No. 5: Functions of the female reproductive system.

2. Purpose: to study the phases of the sexual cycle and the regulation of sexual functions.

3. Learning objectives: using manuals, diagrams and models, study the phases of the menstrual cycle and the regulation of sexual functions.

4. Main questions of the topic

- 1. Physiology of sexual development.
- 2. Functions of the female genital organs.
- 3. Phases of the reproductive cycle (hypothalamic-pituitary-ovarian and uterine).
- 4. Menstrual cycle

5. Pregnancy and maternal relations.

6. Lactation.

7. Regulation of sexual functions.


5. Learning and teaching methods

Discussion of the main issues of the topic, performing practical work, completing test tasks.

Laboratory work No. 1.

Phases of the female reproductive cycle (hypothalamic-pituitary-ovarian and uterine).

6. Assessment methods: oral questioning, assessment of practical work, assessment of test tasks.


<p style="text-align: center;"> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>	
<p style="text-align: center;">  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>	
Department of Morphophysiology	044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"	16 p. from 24

7. Literature: see Appendix No. 1.

8. Control

Tests

- Criteria for reproductive health
 - maternal mortality
 - diseases of the gastrointestinal tract
 - infant mortality
 - perinatal mortality
 - average life expectancy
- The primary sexual characteristics of a person are:
 - genitals
 - voice timbre
 - body hair
 - constitution
 - structural features of the pelvis
- Secondary sexual characteristics of a person are:
 - body hair, voice timbre
 - genitals
 - gonads
 - urethra
 - uterus
- Sex cells contain... a set of chromosomes.
 - haploid
 - tetraploid
 - diploid
 - triploid
 - smashed
- Ovulation is called:
 - release of the oocyte from the follicle
 - movement of the egg through the fallopian tube
 - penetration of the egg into the uterus
 - implantation of the egg into the uterine mucosa
 - movement of sperm in the egg
- The corpus luteum produces hormone(s):
 - progesterone
 - estrogens
 - androgens
 - testosterone
 - prolactin
- The inner lining of the fallopian tubes is lined with:

<p> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		 <p> SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		17 p. from 24

- a) ciliated epithelium
 - b) multilayered, flat non-eroding epithelium
 - c) adventitia
 - d) villous epithelium
 - e) connective tissue
8. Rupture of the follicle, which has matured in the ovary, leads to the release of the egg into:
- a) abdominal cavity
 - b) cervix
 - c) uterus
 - d) fallopian tube
 - e) vagina
9. Ovarian function
- a) endocrine-hormonal
 - b) excretory
 - c) protective
 - d) transport
 - e) nutritious
10. Hormones that control the menstrual cycle....
- a) FSH, estrogens, LSH, progesteron
 - b) melanotropin, androgens, LSG, progesteron
 - c) STH, FSH, progesteron, estrogens
 - d) FSH, glucagon, growth hormone, parathyroid hormone
 - e) FSH, insulin, progesteron

Topic No. 6 Functions of the male reproductive system.

2. Purpose: to study the processes of spermatogenesis and the regulation of sexual functions.

3. Learning objectives: using manuals, diagrams and models to study spermatogenesis and the regulation of sexual functions.

4. Main questions of the topic

- 1. Physiology of sexual development.
- 2. Functions of male genital organs.

3. Spermatogenesis

- 4. Functions of the accessory glands.
- 5. Hormonal function of the testes.


5. Learning and teaching methods

Discussion of the main issues of the topic, performing practical work, completing test tasks.

Laboratory work No. 1.

Stages of male sexual development

6. Assessment methods: oral questioning, assessment of practical work, assessment of test tasks.

<p style="text-align: center;"> ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>			<p style="text-align: center;"> SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>	
Department of Morphophysiology			044-53/19-12 В	
Methodological recommendations for practical classes in the discipline "Physiology"			18 p. from 24	

7. Literature: see Appendix No. 1.

8. Control

Tests

1. Criteria for reproductive health....

- a) maternal mortality
- b) diseases of the gastrointestinal tract
- c) infant mortality
- d) perinatal mortality
- e) average life expectancy

2. The primary sexual characteristics of a person are:

- a) genitals
- b) voice timbre
- c) body hair
- d) constitution
- e) structural features of the pelvis

3. Secondary sexual characteristics of a person are:

- a) body hair, voice timbre
- b) genitals
- c) gonads
- d) urethra
- e) uterus

4. Sex cells contain... a set of chromosomes.


- a) haploid
- b) tetraploid
- c) diploid
- d) triploid
- e) smashed

5. The testes in the human body are located in....


- a) scrotum
- b) abdominal cavity
- c) pelvis
- d) prostate gland
- e) large pelvis

6. The testicle produces a hormone... .

- a) testosterone
- b) estrogen
- c) progesterone
- d) adrenaline
- e) thyroxine

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Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		19 p. from 24

7. The composition of the seminal fluid contains products from all the named formations, except
- prostate gland
 - seminal vesicles
 - Bartholin glands
 - bulbourethral glands
8. The epididymis of the testis performs all of the indicated functions, except
- formation of germ cells
 - conduction of germ cells
 - ensuring the maturation of germ cells
 - secretion of fluid that dilutes sperm
9. Testosterone stimulates all of the following features in men during puberty, except
- breast growth
 - male pattern hair growth
 - deepening of the voice
 - growth of muscle mass
10. During the reproduction phase, spermatogenesis occurs
- reduction division of spermatocytes
 - reduction division of spermatogonia
 - mitotic division of spermatogonia
 - DNA reduplication in spermatocytes
11. The prostate gland performs a function
- secretion of enzymes
 - secretion of fluid that dilutes sperm
 - in spermatogenesis
 - testosterone synthesis
12. The full cycle of spermatogenesis takes place in curved seminiferous tubules
- in 30 hours
 - 5 days
 - in 65 days
 - for 2 years
13. The normal course of spermatogenesis occurs at temperature
- 34.00 C and below
 - 36.60 C
 - 37.00 C
 - 38.00 C

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Department of Morphophysiology		044-53/19-12 B
Methodological recommendations for practical classes in the discipline "Physiology"		20 p. from 24

Appendix 1

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Department of Morphophysiology		044-53/19-12 B
Methodological recommendations for practical classes in the discipline "Physiology"		21 p. from 24

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Department of Morphophysiology		044-53/19-12 B
Methodological recommendations for practical classes in the discipline "Physiology"		22 p. from 24

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4	Electronic library of "Student Adviser" Medical University	http://www.studmedlib.ru
5	"Paragraph" information system "Medicine" department	https://online.zakon.kz/Medicine
6	"Law" is an electronic source of legal information	https://zan.kz
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9	«Web of science» (Thomson Reuters)	http://apps.webofknowledge.com
10	«Science Direct» (Elsevier)	https://www.sciencedirect.com
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Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		23 p. from 24

<p> ОҢТҰСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ </p>		<p>  SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия» </p>
Department of Morphophysiology		044-53/19-12 В
Methodological recommendations for practical classes in the discipline "Physiology"		24 p. from 24