**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE**

Department of Biochemistry named after academician Maxim Gulyi

**APPROVED**
Dean of the Faculty of
Veterinary Medicine
_____ Tsvilikhovskyi M.I
"11" 06 2017


**REVIEWED AND APPROVED**
meeting of the department of biochemistry
named acad. Maxim Guliy
Protocol № 11 of 15.05.2017
Acting head of Department
_____ Tomchuk V.A.

**PROGRAM OF THE COURSE**

# Veterinary clinical biochemistry

Direction of training: 6.110101 – "Veterinary Medicine"
Specialty: EQL Bachelor 6.110101 – "Veterinary Medicine"
Specialization: _____
Faculty: Veterinary Medicine
Working the curriculum were:

| | |
|---|---|
| Doctor of Vet Sciences, Prof. | V.A. Tomchuk |
| Ph.D., Assoc. | V.I. Tsvilikhovskyi |
| Doctor of Vet Sciences, Prof. | V.A. Grishchenko |

Kyiv – 2017

Veterinary clinical biochemistry

(name)

| Industry knowledge, training direction, specialty, education level | | |
|---|---|---|
| Educational qualification | EQL Bachelor 6.110101 – " Veterinary Medicine "<br>(code and name) | |
| Training direction | 6.110101 – " Veterinary Medicine | |
| Specialty | EQL Bachelor 6.110101 – " Veterinary Medicine "<br>(code and name) | |
| Education level | Bachelor<br>(bachelor, specialist, master) | |
| **Description of the course** | | |
| Description | Normative (selective) | |
| Total hours | 60 | |
| Quantity of credits ECTS | 2 | |
| Quantity of content modules | 2 | |
| Course project (work)<br>(if in your educational plan) | Veterinary clinical biochemistry<br>(name) | |
| Form of control | Differential test | |
| **Descriptions of the course for full-time and external form of education** | | |
| | full-time education | external form of education |
| Year of training | 2017-2018 | |
| Semester | 7 | |
| Lectures | 15 h. | h. |
| Practical, seminars | h. | h. |
| Laboratory classes | 30 h. | h. |
| Independent work | 15 h. | h. |
| Individual tasks | 70 h. | h. |
| Quantity of weekly hours for full-time students: classroom | 3 h. | |

## 2. Objectives of the course

**The aim** of the course – to give students the necessary theoretical knowledge and practical skills for obtaining equipment and learning diverse biological material obtained from sick animals for clinical and biological research and laboratory analysis, including for a correct interpretation of the results of these studies.

**Target.** A study of the course the student should:

- **know** the features of biochemical processes in the body during different animal diseases and indicators that characterize them, to understand the molecular mechanisms of pathogenesis of many diseases of various etiologies;
- **be able to** receive a variety of biological material, conduct necessary laboratory tests and among a large number of laboratory methods to select the most informative measure the effectiveness of drugs and the degree of recovery processes in the affected tissues and organs and to interpret the obtained results, comparing them with the symptoms of disease.

## 3. The program of the course and structure of the course

### Content module 1. General veterinary clinical biochemistry

**Lecture 1. Objects and methods in clinical biochemistry.**

Methods of preparation for examination of blood, urine, saliva, rumen contents, digestive juices, bile, cerebrospinal fluid, synovial fluid and other biological fluids domestic and farm animals; puncture and aspiration, liver biopsy, methods of producing bile.

Characterization of physical and chemical methods of clinical biochemistry. Instrumentation.

Species, breed and age characteristics of biochemical parameters (blood, urine, cerebrospinal fluid, digestive juices, saliva, etc..) in healthy animals and their

dependence on the physiological state, such as feeding and performance. Internatsionapna system of units SI (SI) in clinical laboratory diagnosis.

Modern methods of mathematical processing of the results.

**Lectures 2. Disorders of protein metabolism in case of diseases of the internal organs of animals.**

Disorders of protein homeostasis. Hypo- and albuminosis, dysproteinemia, paraproteyinemiya and proteinuria, the etiology of their occurrence. Clinical interpretation of the definition of total protein and protein fractions. Colloid-sediment samples and their importance in the diagnosis of metabolic proteins in the pathology of liver and other organs. Biochemical methods of diagnosing of protein metabolism diseases in the body and control its recovery.

Methods and clinical diagnostic values of determination in blood and urine components of residual nitrogen: urea, alternating nitrogen, uric acid, ammonia, creatine, creatinine, indican and others. Azotemia: relative and absolute, productional and retention.

**Content module 2. General and special clinical biochemistry**.

**Lecture 3. Laboratory diagnosis of disorders of carbohydrate metabolism in the case of diseases of the internal organs of animals.**

Disorders of intermediate metabolism of carbohydrates: synthesis and breakdown of monosaccharides, oligosaccharides, glycogen. Gluconeogenesis and its disorders. Hypo-and hyperglycemia, glucosuria, and fruktosuria, galactosuria and their clinical interpretation. Metabolic disturbances heteropolysaccharides.

Disorders of intermediary metabolism of lipids in the case of intestinal diseases, liver and pancreas. Obesity. Lipomobilization syndrome. Fatty liver, atherosclerosis. Ketogenesis and its disorders. Indicators of lipid peroxidation and antioxidant defense system of the body.

Biochemical methods of diagnosing disorders of lipid metabolism and control of its recovery.

**Lectures 4. Laboratory diagnosis of lipid metabolism disorders in the case of diseases of the internal organs of animals.**

Disorders of intermediary metabolism of lipids in the case of intestinal diseases, liver and pancreas. Obesity. Lipomobilization syndrome. Fatty liver, atherosclerosis. Ketogenesis and its disorders. Indicators of lipid peroxidation and antioxidant defense system of the body.

Biochemical methods of diagnosing disorders of lipid metabolism and control of its recovery.

**Lectures 5. Clinical fermentologia. Primary and secondary fermentopathy.** Fermentopathy and its variations, and fermentodiagnostic fermentoterapiya. Signal enzymes and their role in the diagnosis of diseases of various organs and systems. Mechanisms hyperenzymemia.

Determination of activity and isozyme spectrum enzymes (aspartate aminotransferase, alanine aminotransferase, lactate dehydrogenase, alaninaminopeptydazy, gamma glutamyl, alkaline and acid phosphatases, hlutamatdehidrohenazy, creatine, alpha-amylase, protease, lipase, etc.). The clinical interpretation of the results.

**Lectures 6. Enzymodiagnostics in the pathology of the internal organs of animals.**

Fermentodiagnostic and fermentotherapy. Indicator enzymes and their role in the diagnosis of diseases of various organs and systems. Determination of isozyme spectrum and enzymes (aspartate aminotransferase, alanine aminotransferase, lactate dehydrogenase, alaninaminopeptydazy gamma hlutamiltranspeptydazy, alkaline and acid phosphatase, hlutamatdehidrohenazy, creatine, alpha-amylase, protease, lipase, etc.). The clinical interpretation of the results.

**Lectures 7. Biochemistry and pathobiochemistry of blood system in animals in the pathology of internal organs.**

Exchange disorder of hemoglobin. Hemohlobinozy. Biochemical changes in the blood anemia.

System and mechanisms of blood clotting. Pathobiochemistry of coagulation. Anticoagulation blood system. Disorders of hemostasis: hypocoagulation, hypercoagulable and dyskoahulyatsiya.

Metabolism in the myocardium during myocardial dystrophy, myocarditis, pericarditis, coronary heart disease and heart attacks. Biochemical methods of diagnosing myocardial diseases.

Changes in acid-base balance during pneumonia. Changes of oxidoreductase activity, digestive enzymes, metabolic and fibrinolytic system in case of pneumonia. Methods of biochemical control during respiratory diseases: definition of the content of sialic acids, acute phase proteins, carrying bronchopulmonary test etc.).

**Lectures 8. Laboratory diagnosis in the pathology of the urinary system.**

Features metabolism in the kidney in case of pathology. Formation and urine pathology. Indicators of glomerular filtration rate and their diagnostic value. Biochemical methods enzymodiagnostics if renal pathology.

Changes in the chemical composition of urine in the urinary system diseases: glomerulonephritis, pyelonephritis, nephrotic syndrome, nephrosclerosis, renal failure, urolithiasis and urotsystyti. Abnormal urine components. Proteinuria, glucosuria, lipuriya, hematuria, Ketonuria, bilirubinuria and their diagnostic value. Biochemical mechanisms of urolithiasis. Biochemical methods of urine, interpretation of the results in the differential diagnosis and treatment of animal diseases in the case of the urinary system.

| Titles content modules | Hours | | | | | | |
|---|---|---|---|---|---|---|---|
| | full-time | | | | | | |
| | weeks | total | including | | | | |
| | | | L | P | Lab | Ind | I.w |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Content module 1. General veterinary clinical biochemistry | | | | | | | |
| Topic 1. Objects and methods in clinical biochemistry. | 1 | 5 | 1 | - | 2 | - | 2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Topic 2. Disorders of protein metabolism in the case of diseases of the internal organs of animals. | 2-3 | 10 | 2 | - | 6 | - | 2 |
| Together for content module 1 | 15 | | 3 | - | 8 | - | 4 |
| Content module 2. . General and special clinical biochemistry | | | | | | | |
| Topic 3. Laboratory diagnosis of disorders of carbohydrate metabolism in the case of diseases of the internal organs of animals. | 4-5 | 8 | 2 | - | 4 | - | 2 |
| Topic 4. Laboratory diagnosis of disorders lipid metabolism in the case of diseases of the internal organs of animals. | 6-7 | 8 | 2 | | 4 | | 2 |
| Topic 5. Clinical fermentologia. Primary and secondary fermentopathy. | 8 | 5 | 2 | - | 2 | - | 1 |
| Topic 6. Enzymodiagnostics in the pathology of the internal organs of animals. | 9 | 5 | 2 | - | 2 | - | 1 |
| Topic 7. Clinical chemistry with the pathology of the digestive system, liver and pancreas. | 10 | 5 | - | - | 4 | - | 1 |
| Topic 8. Biochemistry and pathobiochemistry blood system in animals in the pathology of internal organs. | 11 | 5 | 2 | - | 2 | - | 1 |
| Topic 9. Determination of water-electrolyte and acid-base status of animals in the pathology of the internal organs of animals. | 12 | 3 | - | - | 2 | - | 1 |
| Topic 10. Laboratory diagnosis in the pathology of the urinary system | 13-14 | 5 | 2 | - | 2 | - | 1 |
| Topic 11. Biochemical methods immunodeficiency state of animals. | 15 | 3 | - | - | - | - | 1 |
| Together for content modules 2 | 45 | | 12 | - | 22 | - | 11 |
| Total hours | 60 | | 15 | - | 30 | | 15 |
| Course work in veterinary clinical biochemistry | 70 | | - | - | - | 70 | - |
| Total hours | 130 | | 15 | - | 30 | 70 | 15 |

## 6. Topics for laboratory lessons

| № | Topic name | Hours |
|---|---|---|
| 1 | Safety at work in biochemical laboratories. Preparation of biological material for the clinical and biochemical studies. Laboratory examination of gastric juice. | 2 |
| 2 | Studies of total protein and protein fractions of blood serum, the interpretation of changes. | 4 |
| 3 | Proteinuria, qualitative and quantitative methods for determination of protein in the urine. The remaining (non-protein) nitrogen and its components, the clinical significance of their research. | 2 |
| 4 | Metabolism of carbohydrates and clinical significance of study parameters of carbohydrate metabolism. Glycosuria, clinical and diagnostic value of research available glucose in the urine. | 4 |
| 5 | Metabolism of lipids and clinical diagnostic value of the study of lipid metabolism. Investigation of ketone bodies in urine. | 4 |
| 6 | Studies of water and electrolyte metabolism and clinical diagnostic value of these studies. | 2 |
| 7 | Investigation of serum enzymes and their significance in the diagnosis of diseases of the internal organs. | 4 |
| 8 | Hemoglobinopathies. Clinical significance study of hemoglobin in the blood | 2 |
| 9 | Clinical biochemistry with liver disease. Determination of total bilirubin and its fractions in biological material. | 4 |
| 10 | Thymol test. Biochemical methods immunodeficient state of the animals. Electrophoresis of serum proteins in polyacrylamide gels. | 2 |
| Total | | 30 |

## 7. Test questions, test kits to determine the level of learning students

**Test questions**

1. Biochemical methods for the whole organism.

2. Subject and methods of discipline "Clinical chemistry"? Its connection with related disciplines. A brief history of the formation of discipline.

3. The role and importance of discipline "Clinical chemistry" in forming a comprehensive veterinary.

4. Clinical Biochemistry equipment and laboratory equipment.

5. The rules of work and safety at work in modern biochemical laboratory. Objects of research in clinical biochemistry.

6. Methods of blood, urine, saliva, rumen contents, cerebrospinal fluid, synovial substances, digestive juices and other biological fluids.

7. Age, breed specific features of biochemical parameters (blood, urine, cerebrospinal fluid, digestive juices, saliva, etc.) in healthy animals.

8. Impact of ecological situation in Ukraine on physiological condition and quality products. Heavy metals as toxicant of animals and humans.

9. Biochemistry disorders of the structure, functions and biochemical processes in the liver, with farm animals. The role of the liver in the metabolism of carbohydrates and main tests of control carbohydrate metabolism in the liver.

10. The role of the liver in lipid metabolism and basic tests monitoring of liver in lipid metabolism.

11. Biosynthetic protein metabolism and liver function. Biochemical tests that establish the state of the liver in protein metabolism.

12. Liver and currency pigments, hormones, vitamins and trace elements. Biochemical tests that monitor the state of the liver in the pigment, hormone, vitamin metabolism and metabolism of bioactive compounds.

13. Disorder of the chemical composition of gastric contents mono- and polihastrychnyh animals. Methods of determination. Normal and abnormal values total, free and bound hydrochloric acid in gastric juice, with different types of farm animals.

14. By what parameters determine the acid-base balance in animals.

14. As classified infringement acid-base status?

15. Clinical significance of determining the acid-base balance of the body sick animals.

16. Correction of metabolic acidosis in the body of newborn calves with acute indigestion.

17. The method of determining acid-base balance in the body of newborn calves?

18. The principle of electrophoresis of serum proteins?

19. Clinical significance of determining aminotransferase activity.

20. Determination of urea in the blood, clinical and diagnostic value?

21. Changes in electrolyte composition of body fluids (Na +, K +, HCO3-, etc.). Acute indigestion in the small intestine.

22. Machinery obtaining blood serum differences and blood plasma.

23. The study of blood proteins. Methods of electrophoresis.

24. What is the role albumin and what functions they are responsible. What are plasma proteins containing metals?

25. With which enzymes can judge the state of the liver?

26. In determining which diseases enzymatic activity of alkaline phosphatase.

27. What are the pigments plasma you can call, clinical and diagnostic value of definition?

28. Factors affecting blood parameters (performance, physiological state, feeding, age, breed, seasonality, etc.)

29. What processes occur in animals with metabolic proteins that occur in this disease?

30. Clinical and biochemical value determination of lipid metabolism. Diseases that occur at the same time.

31. Clinical and biochemical value determination of carbohydrate metabolism, diseases in which it noted violations?

32. What is the rate of sugar in animals and in which the disease is changing?

33. Define and explain the term "renal clearance"?

34. Define and explain the term "renal threshold"?

35. What is the renal threshold for glucose?

36. Define the term "renal azotemia"?

37. Clinical and diagnostic value, that changes the proportion of urine?

38. What are the biochemical changes occurring in acute nephritis?

39. What are the biochemical changes occurring in chronic nephritis?

40. What are the biochemical changes occurring during nephrosis?

41. Define the term glucosuria?

42. Define the term pentosuria?

43. Define the term laktosuria?

44. Define the term fruktosuria?

45. Define the term proteinuria?

46. What are the components of urine you know?

47. What are urinary stones?

48. Define the term cystonuriya?

49. Clinical fermentology. Value section and main directions.

50. Primary fermentopathy.

51. Secondary fermentopathy.

52. Enzymodiagnostics and its value.

53. Acid-base balance of the blood of animals, methods of its determination.

54. State of the acid-base balance in the blood of newborn calves and ways of correction.

55. What are the biochemical studies to hold suspected kidney disease?

56. What devices you know to determine the acid-base balance.

57. How to conduct analysis of the electrophoregram?

58. What is the principle method of zinc sulfate test and its clinical and biochemical values?

59. Principle of thymol test and its clinical and biochemical values?

60. What are the irregularities in the body can cause a change of acid-base status?

61. What methods of correction of the acid-base balance, you know?

62. The principle of the method, clinical and biochemical importance of alkaline reserve of blood plasma.

63. Clinical and biochemical values to determine carotene.

**The set of tests**

Question 1. Blood biochemical sample in cattle, horses, sheep, goats and camels is taken out ....

1 ear vessels

2 cranial vena cava

3 of hearts

4 jugular vein

Question 2. Hyperuricemia

1 increase of uric acid in the urine

2 increase of urea in urine

3 increase of urea in the blood

4 increased uric acid in the blood

Question 3. Sympathetic hyperglycemia occurs ...

1 after the collapse of high fat

2 after an increased degradation of proteins

3 increased after the collapse of glycogen

4 increased after the collapse of amino acids

Question 4. Appearance in serum enzymes whose activity is not found in a healthy body ...

1 parafermentamia

2 disfermentamia

3 dyfektofermentamia

4 polifermentamiya

Question 5. Diabetic hyperglycemia develops ...

1 insufficient secretion of thyroxine

2 inadequate secretion of adrenaline

3 insufficient secretion of glucagon

4 insufficient insulin secretion

Question 6. Out of liver enzymes in the blood in the destruction of cells called ...

1 elumination

2 elimination

3 illumination

4 luminescence

Question 7. What do you understand by the term "proteinuria"?

1 increasing the protein content in the blood

2 increasing protein fractions in the blood

3 reduce protein in the urine

4 appearance of protein in the urine

Question 8. Most often, increased urea in blood occurs by ...

1 liver damage

2 heart disease

3 renal lesions

4 defeat muscles

Question 9. What substances belong to ketone bodies?

1 acetic, butyric, β-oksymaslyana acid

2 propionic, β-oksymaslyana acid

3 β-oksymaslyana, acetoacetic, butyric acid

4 β-oksymaslyana, acetoacetic acid and acetone

Question 10. Which of these components is the most important part of residual nitrogen of blood ....

1 ammonia

2 urea

3 uric acid

4 creatinine

Question 11. The presence of starch in the faeces suggests ...

1 liver diease

2 bowel disease

3 kidney disease

4 pancreas disease

Question 12. For the purposes formolovu use and thymol test?

1 diagnosis of disorders of lipid metabolism

2 diagnosis of disorders of carbohydrate metabolism

3 diagnosis of metabolic lipids and carbohydrates

4 diagnosis of metabolic proteins

Question 13. What transaminase enzymes belong to?

1 ALT, GGT, LDH

2 LDH, GGT, AST

3 ALT, AST, LDH

4 ALT, AST, GGT

Question 14. Anacidic gastritis ...

1 reduce allocation of hydrochloric acid

2 increase allocation of hydrochloric acid

3 miss hydrochloric acid and enzymes

4 no hydrochloric acid

Question 15. Hyperazotemia is ....

1 increasing the total protein in the blood

2 increasing the content of residual nitrogen in the blood

3 increasing of free amino acids in the blood

4 increasing ammonias in blood

Question 16. The level of glucose in the blood which begins glucosuria

1 threshold heart

2 hepatic threshold

3 renal threshold

4 glycemic threshold

Question 17. The formation of lactic acid in animals is

1 for aerobic oxidation of glucose

2 in the urea cycle

3 for the anaerobic oxidation of glucose

4 in β-oxidation of fatty acids

18. The issue of total protein in serum of healthy animals (cattle)?

1 120-130 g / l

2 54-64 g / l

3 30-44 g / l

4 72-86 g / l

Question 19. Indicator liver enzymes?

1 LDH, GGT

2 AST, LDH

3 ALT, GGT

4 SDG, OCT

Question 20. When blood takes in monogastric animals ....

1 in the evening before feeding

2 in the morning, 4 hours after feeding

3 in the morning immediately after feeding

4 in the morning on an empty stomach

Question 21. Gastric Akhil is...

1 reduced allocation of hydrochloric acid

2 increased allocation of hydrochloric acid

3 missing hydrochloric acid and enzymes

4 increased allocations of hydrochloric acid and enzymes

Question 22. What characterizes the enzyme in urine glomerular filtration condition?

1 LDH

2 GGT

3 CE

4 ALT

Question 23. Hyperlipemia is ...

1 increase lipid levels in the urine

2 increase of lipoproteins in the blood

3 increase lipid levels in the blood

4 raising HDL in urine

Question 24. When rumen content is selected

1 before feeding

2 immediately after feeding

3 an hour after feeding

4 three hours after feeding

Question 25. In biochemical studies, birds blood takes from .....

1 forearm saphenous vein

2 underwing veins

3 cranial vena cava

4 lateral shin saphenous vein

Question 26. Residual nitrogen retention increases in blood at hyperazotemia through ....

1 ammonia

2 urea

3 creatinine

4 creatine

Question 27. Hipoacidic gastritis is ...

1 reduced allocation of hydrochloric acid and enzymes

2 missing enzymes

3 missing hydrochloric acid and enzymes

4 reduced allocation of hydrochloric acid

Question 28. Braking cycle of Citric acid formes ...

1 amino acid

2 carbohydrates

3 lipids

4 ketone bodies

Question 29. Which fraction of proteins called "acute phase" .....

1 α-globulins

2 albumin

3 β- globulins

4 g-globulins

Question 30. What do you mean by the term "alkaline reserve"?

1 concentration of anions of carbonic acid [HCO3-] in the blood

2 pCO2 increase in acidosis in the blood.

3 pCO2 reduction in respiratory alkalosis blood

4 reduced pH in the blood.

Question 31. Productive residual nitrogen increases in blood at hyperazotemia due to ....

1 ammonia

2 urea

3 Creatine

4 amino acids

Question 32. In which cells Citric acid cycle is absent....

1 hepatocytes

2 erythrocytes

3 enterocytes

4 epiteliocytes

Question 33. What is renal clearance?

1 is the rate of renal excretion of certain substances from the blood that are not reabsorbed and pass into the urine

2 is the daily urine output

3 is the volume of urine formed in the kidney tubules

4 is a decrease in urine output with insufficient filtering urine glomeruli

Question 34. When blood takes in ruminants ....

1 in the evening before feeding

2 in the morning 4 hours after feeding

3 in the morning immediately after feeding

4 in the morning on an empty stomach

Question 35. The end products of fermentation of sugars in the rumen.

1 proteins

2 long-chain fatty acids

3 short chain fatty acids

4 carbohydrates

Question 36. The content of glucose in the blood of healthy animals (cattle)?

1 10,2-20,0 mmol / l

2 1,5-20,0 mmol / l

3 7,2-8,5 mmol / l

4 2,5-3,3 mmol / l

Question 37. Where is the final conversion of carbohydrates?

1 in the stomach and small intestine

2 in the small and large intestine

3 in the small intestine

4 in the stomach

Question 38. Positive results from tests with colloidal bases mercuric chloride, copper sulfate, formaldehyde and talk about ...

1 protein synthesis abuse renal function

2 disorder of protein synthesis in liver function

3 breach protein synthesis muscle function

4 disorder of protein synthesis function of heart

Question 39. Excess ammonia in the rumen ...

1 develops alkalosis

2 develops acidosis

3 impact on reducing putrefactive microflora

4 inhibits the formation of toxic products

Question 40. What substance is the main source of energy for the brain tissue?

1 fatty acids

2 lactic acid

3 ketone bodies

4 glucose

5 amino acids

Question 41. Immunoglobulins chemical nature belong to ...

1 glycoproteins

2 lipoproteins

3 nucleoproteins

4 hromoproteins

Question 42. The animal signs of nephrotic syndrome. What changes cause the protein fractions of blood oncotic edema development?

1 reduction of albumin

2 reductions of α1, α2- globulin

3 increased content of β-globulins

4 reduction of γ-globulins

Question 43. In the blood of sick animals found residual nitrogen and urea. The quantity of the residual urea nitrogen significantly less than normal. What organ is typical for this disease?

1 kidney

2 heart

3 colon

4 liver

Question 44. Which group of proteins provides hemostatic coagulation processes?

1 β-globulins

2 albumin

3 fibrinogen

Γ-globulins 4

Question 45. A key component of gastric juice is ...

1 water

2 hydrochloric acid

3 enzymes

4 minerals

5 slime

Question 46. What compound referred to as lipids?

1 phosphatides

2 kephalins

3 cholesterol

4 all items above

Question 47. Which of the following LDH isoenzymes is called hepatospecific...?

1 LDH1

2 LDH2

3 LDH3

4 LDG4

Question 48. There is high glucose in the sick animal blood. Excess of which hormone can lead to such state?

1 insulin

2 noradrenaline

3 adrenaline

4 of oxytocin

5 of testosterone

49. The issue of brain cells during prolonged fasting used as a source of energy ...

1 purines

2 amino acids

3 glutathione

4 acetoacetate

Question 50. Immunoglobulins in the body implementing the humoral immune response to the receipt of foreign macromolecules - antigens. The chemical nature of their non-protein component they belong to the complex proteins:

1 glycoproteins

2 lipoproteins

3 nucleoproteins

4 hromoproteids

Question 51. Name three main short chain fatty acid, which are the end product of fermentation of sugars in the rumen of cattle:

1 propionic, valeric, formic

2 propionic, acetic, izomaslyana

3 formic, Nylon, acetic

4 acetic, propionic, butyric

Question 52. Proteinuria is ...

1 increasing the protein in blood plasma above the norm

2 increase to an amount of protein in the blood that can detect it in the urine

3 presence of proteins in the blood

4 levels of protein in the urine, which can be found

Question 53. Creatinuria is ....

1 increasing above normal total protein in the blood

2 increasing creatine levels above normal

3 increasing of creatine in the blood to the point where it is found in the urine

4 lack of creatine in urine

Question 54. Alimentary hyperglycemia occurs ...

1 after feeding forages with high protein

2 after feeding forages with high levels of carbohydrates

3 after feeding forages with high levels of lipids

4 after feeding forages with high levels of vitamins

Question 55. Hydrolytic breakdown of glycogen is influenced by....

1 transaminases

2 amylase

3 peptidase

4 lipase

Question 56. What substances related to residual nitrogen blood ....

1 ammonia, urea, creatine, creatinine

2 ammonia, glucose, urea, albumin

3 glucose, fructose, urea, creatinine

4 glucose, fructose, mannose, arabinose

Question 57. Hormones only hyperglycemic action ....

1 epinephrine and glucagon

2 adrenaline and insulin

3 insuln and glucagon

4 insulin and thyroxine

Question 58. For biochemical studies, in rabbits' blood takes from...

1 forearm saphenous vein

2 underwing veins

3 lateral shin saphenous vein

4 ears blood vessels, heart

Question 59. For blood biochemical studies, in dogs and cats' blood takes from....

1 cranial vena cava

2 jugular vein

3 lateral shin saphenous vein

4 heart

Question 60. The increase daily urine output?

1 oliguria

2 anury

3 polyuria

4 urinary retention

Question 61. Out of liver enzymes in the blood at the destruction of cells called ...

(In the form of answers concise enter the correct answer)

Question 62. What compound in animals serves as a depot of iron?

(In the form of answers succinctly enter the correct answer)

Question 63. When liver disease and bile secretion chelates reduced. What will happen with fats. What pathological process.

(In the form of answers succinctly enter the correct answer)

Question 64. The process of digestion of carbohydrates control over the content of ..... the blood of animals.

(In the form of answers succinctly enter the correct answer)

Question 65. From what vein takes blood for biochemical studies in cattle, horses, sheep, goats and camels?
(In the form of answers in a word file)

Question 66. Call the emergence enzymes in a serum which activity is not found in a healthy body?
(In the form of answers in a word file)

Question 67. In which cells are fats deposited?
(In the form of answers in a word file)

Question 68. Which term refers determination?
... Divided into primary and secondary. The first group includes hereditary diseases of metabolism in the pathogenesis, which play a major role in absence, shortage or abnormal structure of the enzyme. This is caused by enzymes molecular, or matrix, of the disease.
(In the form of answers in a word file)

Question 69. How is called the daily increase in urine output?
(In the form of answers in a word file)

Question 70. What immunoglobulins provide immune protection for newborns?
(In the form of answers in a word file)

Question 71. What component increases residual nitrogen in the blood at hyperazotemia?
(In the form of answers in a word file)

Question 72. What is the major end product of protein metabolism in animals, which is released in the greatest quantity of urine ...?
(In the form of answers in a word file)

Question 73. Where the reaction of pentose cycle takes part?
(In the form of answers in a word file)

Question 74. Insert missing words in a sentence?
... and their derivatives - a class of biomolecules consisting of monosaccharides, homo- and heteropolysaccharides.
(In the form of answers in a word file)

Question 75. What is the end product of ornitin cycle?
(In the form of answers in a word file)

Question 76. Benchmark metabolism carbohydrates for ruminants are:
(In the form of answers succinctly enter the correct answer)

Question 77. The tendency of the body which lead to excessive weight gain, due to excess fat tissue deposition in the subcutaneous tissue and other tissues and intercellular spaces.
(In the form of answers succinctly enter the correct answer)

Question 78. Reduction of lipids in the blood.
(In the form of answers succinctly enter the correct answer)

Question 79. Disorders of optimal ratio of protein fractions in serum called
(In the form of answers succinctly enter the correct answer)

Question 80. Increasing of the volume of water in the body called:
(In the form of answers succinctly enter the correct answer)

Question 81. The appearance of proteins in blood plasma that unusual for healthy body is called:
(In the form of answers succinctly enter the correct answer)

Question 82. Growing activity of serum enzymes called:
(In the form of answers succinctly enter the correct answer)

Question 83. Which animal GGT activity after two or three napuvan colostrum increases in serum of 15-30 times.
(In the form of answers succinctly enter the correct answer)

Question 84. What characterizes the enzyme in urine glomerular filtration condition?
(In the form of answers in a word file)

Question 85. Insert missing words in a sentence?
... - steroid that has important structural and regulatory functions, forming part of biomembranes and speaking precursor in the synthesis of physiologically active compounds of different classes.
(In the form of answers in a word file)

Question 86. Add as found amylase in renal pathology:
A. increases in serum
B. decreases in urine

Question 87. What jaundice have similar names but three major.

1. Hemolytic obstructive

2. Mechanical nadpechinkova

3. Paranhimatozna hepatic

Question 88. Define the type of jaundice.

A. Hemolytic 1. Disorder of absorption of bilirubin in hepatocytes, conjugating it with hlyukoronovoyu acid and isolating the lumen of the bile ducts in the liver damage

B. Mechanical 2. Excessive destruction of red blood cells

C. Parenchymal 3. Liver and obstruction of the common bile duct

Question 89. The increase of GGT activity indicates abnormal processes:

A. serum 1. hepatobiliary system

B. 2. kidneys in urine

Question 90. Place in accordance with the terms of belonging to their definition

A. liquor

B. Hiperproteyinrahiya

S. Hypothyroidism

D. Endemic goiter

E. infantilism

1. CSF

2. Increasing the concentration of protein in the cerebrospinal fluid

3. Insufficient secretion of thyroid hormones

4. Thyroid disease

5. The disease is caused by insufficient secretion of sex hormones

Question 91. For biochemical studies, blood takes from .....

A. 1. cattle ear vessels

B. horses 2. cranial vena cava

3. V.svyni heart

4. The vessels tail

5. jugular vein

Question 92. When there is excessive breakdown of glycogen:

A. 1. Hyperglycemia alimentary.

B. 2. Hypoglycemia Cute

3. Diabetic

Question 93. Digestion of fats occurs under the action of the enzyme and where it is.

A. 1. ligase gastric juice

2. B. transferase pancreatic juice

3. V. lactate dehydrogenase intestinal juice

G. lipase

Question 94. In which parts of the gastrointestinal tract basic hydrolysis of fats hold and which enzymes take part.

A. 1. ligase stomach

2. B. small intestine lipase

V. colon 3. transferase

4. lactate dehydrogenase

Question 95. In case of insufficient insulin secretion occurs:

A. Hypoglycaemia 1. Nutritional

B. Hyperglycemia 2. Nice

3. Diabetic

Question 96. What group are listed below include globulin proteins

A. α- globulin 1. C-reactive protein

B. β-globulins 2. ceruloplasmin

3. haptoglobin

4. transferrin

Question 97. What nonspecific enzymes are indicative for the diagnosis of liver in various animal?

A. cattle 1. LDH

B. horses 2. LF

B. pigs 3. ACT

G. 4. CE dogs

5. ALT D. cats

Question 98. Specify percentages creatine in the body tissues of animals:

A. skeletal muscles 1. 2%

2. B. Heart 90%

Brain V. 3. 8%

Question 99. For biochemical studies blood takes from....

A. Dogs 1. saphenous vein forearm

B. Poultry 2. cranial vena cava

Horses V. 3. pidkltsevoyi veins

4. jugular vein

Question 100. Pyruvic acid which is converted product at the lack of oxygen in the cell and what enzyme in this reaction involved:

A. ALT 1. butyric acid

B. AST 2. lactic acid

3. V. SDG acetic acid

G. LDH 4. propionic acid

D. HLDH 5. citric acid

The indicative content of the course work

Cover Sheet.

Table of Contents.

List of symbols (if necessary).

Introduction (opening actuality selected theme, object and subject of research objectives and main tasks, methods used).

The first section - the theoretical part (review of the literature on selected topics, analysis of the subject concepts, scientific statements, the extent of the problem).

The second section - the practical part (practical aspects of the topic under study).

The third section - part of the project (innovation and ways to improve the matter investigated).

Conclusions.

References.

Applications (if necessary).

*Estimated coursework subjects*

1. The biological role of vitamin A, and methods of diagnosis failures.
2. Biochemical metabolism in animals by changing the balance of electrolytes.
3. Biochemistry and Pathobiochemistry blood coagulation system.
4. Free-radical processes in animals.
5. Effect of metabolic lipoproteins in the body of the general physiological condition of the animal.
6. Thyroid hormones and causes a violation of their allocation in thyroid pathology.
7. The dependence of biochemical indicators of age animals.
8. Coronary heart disease and its laboratory diagnosis.

9. Metabolism of amino acids and hereditary disorders of metabolism.
10. Bone metabolism in disorder of the endocrine system.
11. Local and general impact of cancer on biochemical indicators of an animal.
12. Renal failure and its consequences in animals.
13. Metabolism in animals from pancreatitis.
14. Exchange processes in animals at hiperteriozi.
15. Exchange processes in animals with hypothyroidism.
16. Exchange processes in violation of mineral metabolism in animals.
17. Features of jaundice in cats and dogs.
18. Zhovchoutvoryuvalnoyi and biliary disorders of the liver and diagnostics.
19. Violation of metabolic and respiratory alkalosis: causes and consequences.
20. Violation of metabolic and respiratory acidosis: causes and consequences.
21. Disorders of calcium metabolism in the body and its laboratory diagnosis.
22. Causes of hypokalemia and its laboratory evaluation.
23. Causes of hyponatremia and its laboratory evaluation.
24. The causes of acute renal failure in dogs and cats.
25. The role of non-protein nitrogen components in the blood and their clinical diagnostic value in disease.
26. Diabetes mellitus: causes and consequences.

## 8. Teaching methods

The organization of education in National University of Life and Environmental Sciences of Ukraine means a combination of classroom and extracurricular learning, such as:

- Lectures;
- Seminars;
- Workshops (laboratory work, laboratory practice);
- Independent classroom hours;
- Independent class work of students;

- Advice;
- Course design (coursework);
- Graduation design (thesis);
- All types of practices.

To control the quality of knowledge and skills students are used:

- Control of work;
- Individual interview;
- Colloquiums;
- Tests;
- Examinations;
- Protection projects and dissertations;
- State exams;
- A comprehensive examination in the specialty.

During the study course "Clinical Biochemistry" use the following teaching methods:

- Lectures;
- Laboratory classes;
- Independent classroom hours;
- Independent class work of students;
- Coursework

## 9. Forms of control

Monitoring and evaluation of academic performance of students is an important part of the educational process in higher education.

Control (from Fr. Control) in the didactics of higher education should be understood as a pedagogical support, monitoring and verification of successful teaching and learning of students.

Process control exercised by the teacher involves several steps:

1) test (detection level obtained by the students' knowledge and skills);

2) assessment (measurement of knowledge, skills, and compare them with certain standards defined curriculum requirements);

3) accounting (fixation results in the form of ratings, scores, rankings magazine student's record book, scoring or examination information).

By controlling teaching and learning activities of students, faculty aims to address the following objectives:

- Identify the quality of learning, the extent to which the obtained skills goals and objectives of the course;

- Identify difficulties in mastering educational information and standard errors for the purpose of correction and elimination;

- Determination of efficiency of organizational forms, methods and means of education;

- Diagnosing the level of students' readiness to accept new material.

Normal control the following functions:

- Training (education), which is to control measures contributed to the deepening, widening, improvement and systematization of knowledge and skills students provide feedback on learning;

- Diagnostic and corrective aimed at determining the level of knowledge, skills, and common errors, gaps and difficulties in learning, causes of failure and ensure corrective action;

- Estimates, which is to clarify the state of knowledge, skills and abilities of individual students and academic group as a whole, and provides accounting and transparency control results, contributing to the objective evaluation and better training;

- Stimulating, providing for the approval of the students achieved success and formation of positive motivation for learning, systematic teaching and learning activities, developing a sense of responsibility for its effectiveness;

- Developing, which consists in the fact that under systematic, developing pedagogically appropriate control memory, attention, thinking, oral and written expression, ability, educational interests, activity and independence of students;

- Educational, aimed at shaping discipline, organization, self-discipline skills, positive attitudes to learning, the need for ongoing formation of self-education and self-improvement;

- Prognostic and methodical, which refers both to the teacher (who is very precise information on the effectiveness of the activity), and students as an optimal teaching, improve teaching methods, can significantly affect the outcome - the quality of vocational training graduates.

The following types of controls: previous, current, topical, final.

Ante control is carried out to identify the level of student preparedness to accept new material. Such verification may be conducted in the form of tests, written tests, oral questioning front on practical exercises, individual or group counseling.

Content Knowledge test is aimed at determining the level of mastering a particular topic or more related subjects (modules). One of the main objectives is to create a content check prerequisite for understanding and synthesis of a sufficiently large volume of training data. For the thematic control, which can be done at the final seminar or colloquium in the module or content tests, tasks are selected and constructed so as to eliminate the elements of chance and objectively assess the educational progress of students in all sections of the theme.

Final control is to check the level of learning, practical abilities and skills of students over a long period of time learning semester, the entire period of study at the university. The purpose of the final control is to identify the knowledge structure and knowledge of students. The components of the control – terminal control and state certification. Allow the student to the final control if the performance of all types of work, the curriculum for the semester in this discipline.

Credit – special means to implement the final inspection and assessment of academic achievement of students.

Semester credit – a form of total control from a single discipline per semester, which aims to test the assimilation of theoretical and practical material.

Credits are for the paper, approved by the department. Teacher necessarily introduces students to the content exam questions.

To control the quality of knowledge and skills of students in the discipline "Veterinary clinical biochemistry", the following control measures:

- Module tests;
- Individual objectives;
- Individual interview;
- Protection of coursework;
- Offset.

10. **Distribution Points that receive students.** Targeting the student is in accordance with the provisions of "On the examinations and tests NUBiP in Ukraine" dated 02/20/2015. The protocol №6 from the table. 1

**Grading scale: national and ECTS**

<table>
<tr><td rowspan="2">Total points for all the educational activities</td><td rowspan="2">Mark ECTS</td><td colspan="2">Assessment on a national scale</td></tr>
<tr><td>for examination, course project (work) practices</td><td>for credit</td></tr>
<tr><td>90-100</td><td>A</td><td>excellent</td><td rowspan="5">Accepted</td></tr>
<tr><td>82-89</td><td>B</td><td rowspan="2">good</td></tr>
<tr><td>74-81</td><td>C</td></tr>
<tr><td>64-73</td><td>D</td><td rowspan="2">satisfactorily</td></tr>
<tr><td>60-63</td><td>E</td></tr>
<tr><td>35-59</td><td>FX</td><td>unsatisfactory with the possibility of re-compiling</td><td>not accepted with the possibility of re-compiling</td></tr>
<tr><td>0-34</td><td>F</td><td>unsatisfactory with mandatory re-learning courses</td><td>Fail with mandatory re-learning courses</td></tr>
</table>

## 11. Methodological support

1. Clinical chemistry: Guidance for laboratory works for students specializing 6.110101 – Veterinary medecine / Tomchuk V., Tsvilikhovskyi V. // K., NUBiP Ukraine, 2015. – 67 p.
2. Guidelines to prepare coursework in the discipline "Clinical biochemistry" specialty 6.110101 – ветеринарна медицина / Tomchuk V., Tsvilikhovskyi V., // K., NUBiP Ukraine, 2012. – 18 p.
3. Working notebook from discipline "Clinical biochemistry" / V. Tomchuk, V.Tsvilikhovskyi, V. Grischenko .– K.: NUBiP Ukraine, 2013. – 34 p.

## 12. Recommended reading

### Basic


1. Veterinary clinical biochemistry: teach. Handbook. [for students education teach. institut] / [Melnichuk D., GrishchenkoV., Tomchuk V. at al.]; for editor. D. Melnichuk. – K: НУБіП України, 2009. – 310 p.
2. Angelsky S. Clinical biochemestry / Angelsky S., Iakubovskyi Z., Dominchak M.; transl from pol. – Sopot, 1998. – 451 p
3. Veterinary clinical biochemistry / [LevchenkoV., Vlizlo V., Kondrakhin I. at al.]; for editor. V. Levchenko and V/ Galias. – B. Tserkva: БДАУ, 2002. – 400 p.
4. Goriachkovskyi A. Clinical biochemestry / Goriachkovskyi A.. – Odesa: Astroprint, 1998. – 608 p.


### Supplemental


1. Veterinary clinical biochemistry: textbook / V.A.Tomchuk, V.A. Gryshchenko, V.I. Tsvilikhovskyi – Part 1. – K.: НУБіП України, 2016. – 268 p.
2. Камышников В. С. Справочник по клинико-биохимической лабораторной диагностик / Камышников В. С. – [в 2-х т.]. – Минск: Беларусь, 2000. – Т. 1. – 495 с; Т. 2. – 463 с.
3. Клиническая лабораторная диагностика в ветеринарии / [И. П. Кондрахин, Н. В. Курилов, А. Т. Малахов и др.]. – М.: Агропромиздат, 1985. – 286 с.
4. Клінічна біохімія : навч. посіб. [для студ. вищ. навч. зал.] / [О. П. Тимошенко, Л. М. В. Вороніна, В. М. Кравченко та ін.]; за ред. О. П. Тимошенко. – [2-е вид.]. – Київ: ВД «Професіонал», 2005. – 288 с.
5. Кононський О. І. Біохімія тварин: підруч. [для студ. вищ. навч. зал.] / О. І. Кононський – [2-е вид.]. – К.: Вища шк., 2006. – 454 с.
6. Куртяк Б. М. Жиророзчинні вітаміни у ветеринарній медицині / Б. М. Куртяк, В. Г. Янович. – Львів: Тріада плюс, 2004. – 426 с.
7. Мазуркевич А. Й. Фізіологія тварин / Мазуркевич А. Й., Карповський В. І., Камбур М. Д. та ін. – Вінниця: Нова книга, 2010. – 418 с.
8. Мейер Д. Ветеринарная лабораторная медицина. Интерпретация и диагностика / Мейер Д., Харви Дж.; [пер. с англ.]. – М.: Софион, 2007. – 456 с.


## 13. Information resources

1. http://nubip.edu.ua/node/4210
2. http://vetmed.nauu.kiev.ua/