Assessment tools for conducting attestation in discipline «Clinical Biochemistry» for students of 2024 year of admission under the educational program 31.05.01 General Medicine, profile General Medicine, (Specialist's degree), form of study full-time for the 2025-2026 academic year

1. Assessment tools for conducting current attestation in discipline

1.1. Assessment tools for certification during seminar-type classes**.**

The current attestation includes the following types of tasks: testing, solving situational tasks, assessment of practical skills (abilities) mastery, interview on control questions, preparation of a report.

1.1.1. Examples of test assignments

Assessed competency achievement indicators: UPC-1.2.1, PK-2.2.2.

1. Blood creatinine levels increase in...

a) chronic renal failure
b) hepatitis
c) gastritis
d) ulcerative colitis

2. The most pronounced increase in C-reactive protein is observed in...

a) viral infections
b) scleroderma
c) bacterial infections
d) leukemia

3. Irreversible damage to cardiomyocytes is accompanied by an increase in serum levels of...

a) alkaline phosphatase
b) ALT
c) GGTP
d) histidase
e) MB-CK

4. In the preicteric period of acute viral hepatitis, serum activity is typically elevated for...

a) AST
b) alpha-amylase
c) sorbitol dehydrogenase
d) ALT
e) alkaline phosphatase

5. Physiological jaundice of newborns is characterized by...

a) severe anemia, reticulocytosis, erythro- and normoblastosis, hyperbilirubinemia due to the indirect fraction ranging from 100 to 342 μmol/L, peaking at 3–5 days of life
b) an increase in indirect bilirubin concentration in serum to 140–240 μmol/L

6. Cholestatic jaundice is characterized by...

a) hyperbilirubinemia due to the direct fraction

b) hyperbilirubinemia due to the indirect fraction

c) bilirubinuria

d) absence of urobilinogen in urine

7. Hemolytic jaundice can be distinguished from obstructive jaundice by...

a) bilirubin fractions

b) reticulocyte count

c) serum iron level

d) alkaline phosphatase

8. Acute inflammation corresponds to the serum proteinogram...

a) decreased albumin levels, increased α2- and γ-globulins

b) decreased albumin levels, increased α1-, α2-, and γ-globulins

c) decreased albumin and γ-globulin levels, increased α2- and β-globulins

d) decreased albumin levels, significant increase in all globulin fractions

e) decreased albumin levels, increased β- and γ-globulins

f) decreased albumin and α2-globulin levels, increased β- and γ-globulins

9. Laboratory tests for the diagnosis of acute pancreatitis primarily include…

a) alkaline phosphatase

b) stercobilin

c) transaminases

d) alpha-amylase

10. The renal threshold for glucose is…

a) 8.0-9.0 mmol/L

b) 8.9-10 mmol/L

c) 10-15 mmol/L

1.1.2. Example of a situational task

Assessed indicators of competency achievement: UPC-1.2.1, PK-2.2.2.

Case history	
A 20-year-old student developed flu-like symptoms accompanied by loss of appetite, nausea, vomiting, and pain in the right upper quadrant. On examination: the liver was enlarged and tender to palpation. After 2 days, jaundice developed, the urine became dark, and the stool turned pale.	
Laboratory results	
Serum:	
Total bilirubin	48 μmol/L
Direct bilirubin	18 μmol/L
AST	450 IU/L
Urine:	
Bilirubin	«+»
Urobilinogen	«+»

Familiarize yourself with the situation and provide detailed answers to the questions.

Questions:

1. What is the cause of jaundice in the patient?
2. What does the increased AST (aspartate aminotransferase) activity indicate?

3. What is direct bilirubin? What is its reference interval?
4. What is the presumptive diagnosis? What additional laboratory tests should be performed?

1.1.3. Examples of practical skills assessment tasks

Assessed indicators of competency achievement: UPC-1.2.1, PK-2.2.2.

1. Evaluation and interpretation of blood and urine biochemical analysis results in obstructive jaundice.
2. Evaluation and interpretation of urinalysis results in glomerulonephritis.

1.1.4. Examples of control questions for an interview

Assessed competency achievement indicators: UPC-1.2.1, PK-2.2.2.

1. Enzyme diagnostics of liver diseases. Hyper- and hypo-fermentemia in liver diseases. Methods for determining enzyme activity.
2. Pre-hepatic, hepatic, and post-hepatic jaundice: their laboratory differential diagnosis.
3. Bilirubin toxicity. Jaundice in newborns (physiological and hemolytic, jaundice in premature infants, non-hemolytic hyperbilirubinemia in newborns).

1.1.5. Examples of report topics

Assessed competency achievement indicators: UPC-1.2.1, PK-2.2.2.

1. Blood plasma proteins. Methods for determining albumin and globulin levels in blood plasma.
2. Structure and functions of the kidneys. Primary and secondary urine: composition, physicochemical properties. Filterable, reabsorbable, and secretable substances.
3. Water distribution in the body. Composition and content of intra- and extracellular fluid. The role of sodium and potassium in maintaining body homeostasis.

1.2. Assessment tools for students' independent work

Assessment of independent work includes testing.

1.2.1. Examples of multiple-choice test tasks

Assessed indicators of competency achievement: UPC-1.2.1, PK-2.2.2.

1. Choose three out of four answers. Which of the following conditions are associated with metabolic syndrome?
a) Type 2 diabetes mellitus
b) Coronary artery disease
c) Non-alcoholic fatty liver disease
d) Hypothyroidism

2. Choose two out of four answers. Which of the following indices are used to assess insulin resistance?
а) HOMA-IR
б) QUICKI
в) CARO
г) TG/HDL

3. Choose two out of four answers. Which of the following hormones contribute to the development of insulin resistance?

a) Cortisol
b) Leptin
c) Adiponectin
d) Thyroid-stimulating hormone

4. Choose three out of four answers. Which of the following inflammatory markers are often elevated in metabolic syndrome?
a) C-reactive protein (CRP)
b) Interleukin-6 (IL-6)
c) Tumor necrosis factor-alpha (TNF-α)
d) Ferritin

5. Choose four out of five answers. Which indicators are included in the basic lipid profile?
a) Total cholesterol
b) LDL
c) HDL
d) Triglycerides
e) Chylomicrons

6. Choose two answers out of four. Which of the following factors contribute to the development of metabolic syndrome?
a) Physical inactivity (Hypodynamia)
b) Excessive consumption of fats and carbohydrates
c) Smoking
d) Vitamin D deficiency

7. Choose three answers out of four. Which of the following criteria are included in the diagnosis of metabolic syndrome according to the IDF criteria (2005)?
a) waist circumference ≥ 94 cm in men and ≥ 80 cm in women
b) blood pressure ≥ 130/85 mm Hg
c) HDL level < 1.0 mmol/L in men and < 1.2 mmol/L in women
d) fasting glucose level ≥ 5.6 mmol/L

8. Choose three answers out of four. Which indicators reflect atherogenic dyslipidemia?
a) high LDL
b) low HDL
c) high triglycerides
d) high Lp(a)

9. Choose two answers out of four. Which lipid profile indicators have a cardioprotective effect?
a) HDL
b) Apolipoprotein A1
c) LDL
d) Apolipoprotein B

10. Choose two answers out of four. Which mechanism underlies the development of insulin resistance in metabolic syndrome?
a) a decrease in the number of insulin receptors
b) post-receptor defects in signal transduction
c) autoimmune destruction of β-cells
d) excessive secretion of glucagon

1.2.2. Examples of test tasks on matching and on sequencing.

Assessed indicators of competency achievement: UPC-1.2.1, PK-2.2.2.

1. Match the clinical conditions with the changes in the lipid profile by selecting for each position in the first column the corresponding position from the second column:

State	Changes

1. Metabolic syndrome	A. ↑TG, ↓HDL, ↑small dense LDL
2. Familial hypercholesterolemia	B. ↑LDL >4.9 mmol/L
3. Hypothyroidism	C. ↑Total cholesterol, ↑LDL
4. Nephrotic syndrome	D. ↑LDL, ↑VLDL

2. Match the components of lipoproteins with their functions by selecting for each position in the first column the corresponding position from the second column:

Component	Function
1. Apo A1	A. Main protein of HDL
2. Apo B100	B. Ligand for the LDL receptor
3. Apo C2	C. Activator of lipoprotein lipase
4. Apo E	D. Participation in remnant clearance

3. Match the diagnostic criteria for metabolic syndrome with their reference values by selecting for each position in the first column the corresponding position from the second column:

Criterion	Value
1. Waist circumference (men)	A. ≥ 94 cm
2. Triglycerides	B. < 1,2 mmol/L
3. HDL (women)	C. ≥ 1,7 mmol/L
4. Blood pressure	D. ≥ 5,6 mmol/L
5. Fasting glucose	E. ≥ 130/85 mm Hg

4. Establish the sequence: arrange the components of metabolic syndrome in order of their impact on the risk of cardiovascular disease (from highest to lowest). Write down the corresponding sequence of numbers:
1. Arterial hypertension.
2. Dyslipidemia.
3. Hyperglycemia.
4. Abdominal obesity.

5. Establish the sequence: arrange the stages of insulin resistance development in chronological order. Write down the corresponding sequence of numbers:
1. Hyperinsulinemia.
2. Impaired insulin signaling in cells.
3. Compensatory increase in insulin secretion.
4. Development of abdominal obesity.

6. Establish the sequence of steps for performing an oral glucose tolerance test (OGTT). Write down the corresponding sequence of numbers:
1. Fasting blood draw
2. Ingestion of 75 g of glucose
3. Blood draw after 1 hour
4. Blood draw after 2 hours
5. Interpretation of results

1.2.3. Example of a clinical case study

Assessed indicators of competency achievement: UPC-1.2.1, PK-2.2.2.

Task 1. Patient: Male, 52 years old. Presented for a preventive check-up. Waist circumference – 106 cm, blood pressure – 138/90 mm Hg, fasting glucose – 6.0 mmol/L, triglycerides – 2.1 mmol/L, HDL – 0.9 mmol/L.
Question: Does the patient meet the criteria for metabolic syndrome (according to IDF)?

Task 2. Patient: Female, 45 years old. Complaints of fatigue and weight gain. BMI – 29 kg/m², waist circumference – 84 cm, blood pressure – 125/80 mm Hg, glucose – 5.4 mmol/L, triglycerides – 1.6 mmol/L, HDL – 1.4 mmol/L.
Question: Can a diagnosis of metabolic syndrome be made?

Task 3. Patient: Male, 60 years old. Blood pressure – 150/95 mm Hg, glucose – 5.9 mmol/L, TG – 2.3 mmol/L, HDL – 1.0 mmol/L, waist circumference – 100 cm.Question: How many metabolic syndrome criteria does the patient meet (according to ATP III)?

2. Assessment tools for conducting intermediate attestation in a discipline

Intermediate attestation is carried out in the form of an credit.

List of questions for preparation for the intermediate certification

№	Questions for midterm attestation (Credit)	Assessed competency achievement indicators
1.	Main laboratory research methods. Key objectives of laboratory examination. Structure and equipment of modern laboratories	UPC-1.2.1, PK-2.2.2.
2.	The concept of quality control in laboratory studies. Quality criteria. Diagnostic specificity and sensitivity of a test	UPC-1.2.1, PK-2.2.2.
3.	Features of internal and external laboratory quality control in the Volgograd region	UPC-1.2.1, PK-2.2.2.
4.	Types of biological material and collection conditions for clinical laboratory studies	UPC-1.2.1, PK-2.2.2.
5.	Features of blood collection for biochemical studies. Methods for obtaining blood plasma and serum, types of anticoagulants	UPC-1.2.1, PK-2.2.2.
6.	Features of urine collection for laboratory studies: urinalysis, Zimnitsky test, Nechiporenko test, Rehberg test, 24-hour urine collection, two-glass test	UPC-1.2.1, PK-2.2.2.
7.	Основные единицы СИ в биохимии. Средние показатели и референтные величины	UPC-1.2.1, PK-2.2.2.
8.	Basic SI units in biochemistry. Mean values and reference ranges	UPC-1.2.1, PK-2.2.2.
9.	Types of laboratory studies. Screening, preventive, and differential diagnostic studies. Rapid diagnostics	UPC-1.2.1, PK-2.2.2.
10.	Analytical, technical-economic, and diagnostic value of biochemical methods. Standardization of studies	UPC-1.2.1, PK-2.2.2.
11.	Liver functions and methods of their evaluation. Reference ranges of liver laboratory parameters specific to the population of the Volgograd region	UPC-1.2.1, PK-2.2.2.
12.	Clinical and biochemical syndromes in liver diseases. Criteria for laboratory diagnosis	UPC-1.2.1, PK-2.2.2.
13.	Enzyme diagnostics of liver diseases. Hyper- and hypo-fermentemia	UPC-1.2.1, PK-2.2.2.
14.	The significance of alanine and aspartate aminotransferases, lactate dehydrogenase, γ-glutamyltransferase, alkaline phosphatase, glutamate dehydrogenase, and sorbitol dehydrogenase in the diagnosis of liver diseases	UPC-1.2.1, PK-2.2.2.
15.	Jaundice: concept, types, characteristics, differential diagnosis. Hyperbilirubinemia and bilirubinuria	UPC-1.2.1, PK-2.2.2.
16.	Bilirubin metabolism. Free (indirect) and conjugated (direct) bilirubin, urobilinogen and stercobilinogen, bile pigments	UPC-1.2.1, PK-2.2.2.

17.	Bilirubin toxicity. Neonatal jaundice (physiological and hemolytic, jaundice in premature infants, non-hemolytic hyperbilirubinemia in newborns)	UPC-1.2.1, PK-2.2.2.
18.	Determination of total, free, and conjugated bilirubin concentrations. Reference values of bilirubin indicators in blood, urine, and feces of residents of the Volgograd region	UPC-1.2.1, PK-2.2.2.
19.	Protein composition of blood plasma. Functions of blood proteins	UPC-1.2.1, PK-2.2.2.
20.	Total protein in blood serum, hypo- and hyperproteinemia	UPC-1.2.1, PK-2.2.2.
21.	Characteristics of blood protein research methods, their advantages and disadvantages	UPC-1.2.1, PK-2.2.2.
22.	Albumins, hyper- and hypoalbuminemia. Characteristics of globulins. Hyper- and hypoglobulinemias	UPC-1.2.1, PK-2.2.2.
23.	Characteristics of acute-phase inflammatory proteins	UPC-1.2.1, PK-2.2.2.
24.	Proteinograms in various diseases (acute and chronic inflammations, hepatitis, malignant tumors, impaired renal filter, etc.)	UPC-1.2.1, PK-2.2.2.
25.	Pancreas: structure, functions. Insulin, its effect on metabolism. Assessment of pancreatic function. Determination of α-amylase, lipase, and trypsin activity	UPC-1.2.1, PK-2.2.2.
26.	Concept and forms of pancreatitis. Laboratory tests for acute and chronic pancreatitis	UPC-1.2.1, PK-2.2.2.
27.	Diabetes mellitus: definition, classification. Diagnostic criteria for type I and type II diabetes. Hyperglycemia and glucosuria	UPC-1.2.1, PK-2.2.2.
28.	Diagnostic criteria for type I and type II diabetes mellitus. Main symptoms and clinical manifestations	UPC-1.2.1, PK-2.2.2.
29.	Glucose levels in whole blood and plasma: differences. Hyperglycemia and glucosuria	UPC-1.2.1, PK-2.2.2.
30.	Impaired glucose tolerance: concept, diagnostic criteria for the glucose tolerance test. Impaired fasting glucose. Postprandial hyperglycemia	UPC-1.2.1, PK-2.2.2.
31.	Methods for determining blood glucose levels	UPC-1.2.1, PK-2.2.2.
32.	Early laboratory diagnosis of diabetes mellitus	UPC-1.2.1, PK-2.2.2.
33.	Criteria for diabetes compensation. Effective hyperglycemia control: determination of glycosylated hemoglobin and fructosamine	UPC-1.2.1, PK-2.2.2.
34.	Glycosylated hemoglobin, fructosamine: concept	UPC-1.2.1, PK-2.2.2.
35.	Metabolic syndrome: concept, characteristics. Lipid profile indicators in diabetes mellitus	UPC-1.2.1, PK-2.2.2.
36.	Hypoglycemic coma: causes of occurrence	UPC-1.2.1, PK-2.2.2.
37.	Classification and functions of lipids. Atherogenic and antiatherogenic lipoproteins	UPC-1.2.1, PK-2.2.2.
38.	Atherosclerosis: definition, risk factors, and stages of development	UPC-1.2.1, PK-2.2.2.
39.	Disorders of lipid metabolism. Dyslipoproteinemias. Hyperlipoproteinemias	UPC-1.2.1, PK-2.2.2.
40.	Diagnostic significance of cholesterol and its fractions in blood lipoproteins	UPC-1.2.1, PK-2.2.2.

41.	Investigation of lipid metabolism. Friedewald formula	UPC-1.2.1, PK-2.2.2.
42.	Determination of key atherosclerosis indicators: total cholesterol, α-cholesterol (HDL), atherogenic index. Recommended and borderline values of total cholesterol, moderate and severe hypercholesterolemia	UPC-1.2.1, PK-2.2.2.
43.	Recommended and borderline values for total cholesterol, moderate and severe hypercholesterolemia	UPC-1.2.1, PK-2.2.2.
44.	Stages of diagnosis of lipid metabolism disorders	UPC-1.2.1, PK-2.2.2.
45.	Coronary artery disease: concept, risk factors, causes of development	UPC-1.2.1, PK-2.2.2.
46.	Enzyme diagnostics of myocardial infarction	UPC-1.2.1, PK-2.2.2.
47.	Modern requirements for a marker of myocardial necrosis	UPC-1.2.1, PK-2.2.2.
48.	Myocardial infarction: definition, diagnostic criteria. Markers of acute myocardial infarction	UPC-1.2.1, PK-2.2.2.
49.	Laboratory diagnosis of angina pectoris, hypertensive disease	UPC-1.2.1, PK-2.2.2.
50.	Laboratory diagnosis of myocarditis, cardiomyopathies	UPC-1.2.1, PK-2.2.2.
51.	Kidney functions. Functional unit of the kidney. Filtration, reabsorption, clearance, renal threshold	UPC-1.2.1, PK-2.2.2.
52.	Urinalysis. Organized and unorganized urinary sediments. Reference values of urinary biochemical parameters for residents of the Volgograd region	UPC-1.2.1, PK-2.2.2.
53.	Physiological components of urine: urea, creatinine, creatine, uric acid. Methods for their determination	UPC-1.2.1, PK-2.2.2.
54.	Biochemical urine analysis in the diagnosis of kidney diseases. Clearance, transport maximum, renal threshold, functional indicators of kidney function. Diuresis and its disorders: polyuria, oliguria, anuria, nocturia	UPC-1.2.1, PK-2.2.2.
55.	Pathological components of urine: glucosuria, proteinuria and its types. Methods for their determination	UPC-1.2.1, PK-2.2.2.
56.	Clinical and laboratory syndromes of kidney damage. Characteristics	UPC-1.2.1, PK-2.2.2.
57.	Distribution of water in the body. Intracellular fluid. Extracellular fluid. Fluid compartments	UPC-1.2.1, PK-2.2.2.
58.	Assessment of positive and negative water balance in the body. Edema. Mechanisms of edema development in cardiovascular insufficiency and kidney diseases	UPC-1.2.1, PK-2.2.2.
59.	Methods for assessing water balance	UPC-1.2.1, PK-2.2.2.
60.	Osmotic and oncotic pressure. Determination of osmolality	UPC-1.2.1, PK-2.2.2.
61.	Types of water-electrolyte balance disorders. Causes. Characteristics. Criteria for laboratory diagnosis	UPC-1.2.1, PK-2.2.2.
62.	Regulation of sodium and water metabolism. Types of sodium metabolism disorders. Hyponatremia. Hypernatremia	UPC-1.2.1, PK-2.2.2.
63.	Role of potassium ions in the human body. Hyper- and hypokalemia, clinical manifestations. Calcium, hyper- and hypocalcemia in children and adults. Reference values for potassium and calcium ions in the blood of residents of the Volgograd region	UPC-1.2.1, PK-2.2.2.

64.	Hyper- and hypokalemia: clinical manifestations, diagnosis	UPC-1.2.1, PK-2.2.2.
65.	Calcium metabolism. Regulation of calcium metabolism. Hyper- and hypocalcemia in children and adults	UPC-1.2.1, PK-2.2.2.
66.	Role of phosphate ions in the human body, acid-soluble and acid-insoluble fractions. Hyper- and hypophosphatemia in children and adults	UPC-1.2.1, PK-2.2.2.
67.	Methods for determining mineral metabolism parameters	UPC-1.2.1, PK-2.2.2.
68.	Acid-base balance of the body: concept, characteristics. Blood buffer systems	UPC-1.2.1, PK-2.2.2.
69.	Role of physiological systems in maintaining acid-base balance	UPC-1.2.1, PK-2.2.2.
70.	Forms of acid-base balance disorders (alkalosis and acidosis: respiratory, metabolic, compensated, uncompensated). Characteristics. Laboratory indicators	UPC-1.2.1, PK-2.2.2.
71.	Clinical and diagnostic significance of acid-base balance parameters changes	UPC-1.2.1, PK-2.2.2.
72.	General clinical tests, rapid diagnostics of emergency conditions in anesthesiology and intensive care	UPC-1.2.1, PK-2.2.2.

The full fund of assessment tools for the discipline/practice is available in the VolgSMU Electronic Information and Educational System at the link(s):

https://elearning.volgmed.ru/course/view.php?id=1210

Considered at the department meeting of Clinical Laboratory Diagnostics

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Head of the Departmen _____ B.V. Zavodovsky