Assessment tools for conducting attestation in the discipline "Biochemistry, biochemistry of the oral cavity" for students of 2025 year of admission under the educational programme 31.05.03 Dentistry, specialisation (profile) Dentistry, (Specialist's degree), form of study full-time for the 2025-2026 academic year

1. Evaluation tools for for the current attestation of discipline

1.1. Evaluation tools for workshop-type evaluations

The qualification for seminar-type sessions includes the following types of tasks: testing, testing, interview on control issues.

1.1.1. Examples of test assignments

Qualitative indicators to be checked: ОПК -9.1.1, ОПК -8.1.1.

1. Select a characteristic of the connective tissue:
    1. The prevalence of global proteins.
    2. The dominance of fibrillary proteins.
    3. There's a lot of lipoprotein.
    4. A lot of mono-sacharids.
2. Select which of the listed amino acids is found in the collagen in the largest quantity:
    1. Glitzin.
    2. Metionin.
    3. Lisa.
    4. Triptofan.
3. Which of the following characteristics correctly characterizes the collagen.
    1. Kollagen is a full-blown food source of amino acids.
    2. The rate of exchange of collagen increases when ageing.
    3. Collagen is 1/3 of the total protein in the body and is the main structural protein.
    4. The collagen is dominated by lizards, oxylysis, and alanin.
4. What component of the following is needed for prolingidoxylase activity?
    1. Vitamin B6.
    2. NADF.
    3. Succinate.
    4. Vitamin C.
5. Which of these stages of collagen biosynthesis occurs first?
    1. Hydrocksilation of the spill and lisin.
    2. Synthesis of polypeptide chains of procollagen.
    3. Split N - and C - end fragments.
    4. Glycosis.
6. Select one position that correctly characterizes the composition and structure of the fibronectin:
    1. It has a domain structure.
    2. It is a lipoprotein.

3. He only has one ligande connection center.
4. It is a metal protein.

7. What is the reason for the high strength of collagen fibres?
    1. The interaction of proteoglycans with colagen fibrillas.
    2. There's a lot of hydrogen connections.
    3. Lots of covalent connections between the trococollagen molecules.
    4. The formation of dyulphic bridges.
8. I'm sorry. Which of the listed amino acids is dominant in the composition of elastin?
    1. Alanine.
    2. Hydroxyproline.
    3. Lisa.
    4. Triptofan.
9. What effects can vitamin C deficiency have on collagen?
    1. Increase in the amount of oxyproline.
    2. Increased hydrogen connections between polypeptide chains of collagen.
    3. The strength of the collagen molecules is increasing.
    4. Decreasing prolylingdroxylas of fibroblasts.
10. What characteristics of collagen's properties and metabolism help heal wounds?
    1. The high strength of the collagen.
    2. The collagen's ability to inject thrombocytes.
    3. Changes in collagensynthesis cell proliferation by external factors.
    4. The collagen's ability to bind Sa2+.

1.1.2. Examples of control options

Qualitative indicators to be checked: ОПК - 8.1.1.

Check work for Occupation No. 2

Option 1

1. Write the structural formulas of isoleicin, Vale, alanina, as they can be described in terms of solubility.
2. Write the structural formula and the charge of the peptide: tri-ala-gis-met.

Option 2

1. Write the structural formulas of sulphur, cysteine, glutamine, how they can be described in terms of solubility.
2. Write the structural formula and the Peptide charge: fen-gly-gis-glu.

1.1.3. Examples of interview checklists

Qualitative indicators to be checked: ОПК -9.1.1 ОПК -8.1.1.

1. Allosteric regulation of enzyme activity. The construction of allosteric enzymes, the concept of an allosteric center. Reverse regulation.
2. Association and dissociation of regulatory proteins as a way to regulate fermentative activity by example of proteinkinase A, acetyl-Coa carboxylas.
3. Protheoltic modification of enzyme activity. Limited proteolosis as a way to regulate the activity of proteolitic enzymes and its significance to the body.
4. Inhibiting enzyme activity. Inhibition types: reversible and irreversible, competitive, non-competitive.
5. Drugs are like enzyme inhibitors.

№	exam questions	
1.	Enzymes. Features of enzymatic catalysis. Enzyme specificity. Classification and the nomenclature of enzymes.	ОПК-9.1.1./з-1
2.	Primary structure of proteins. Properties of peptide bonds. Relationships between primary structure and protein biological properties (on the example of hemoglobin and insulin).	ОПК-8.1.1./з-1
3.	The factors determining conformation changes of proteins. Denaturation, factors its causing. Protection from denaturation by the specialized heat shock proteins (chaperons).	ОПК-8.1.1./з-1
4.	The active site of proteins and its specific interaction with ligand as a basis of biological function of proteins. The protein-ligand complementary interaction.	ОПК-8.1.1./з-1
5.	The nutrition. The basic food substances – proteins, carbohydrates, fats, daily allowed (requirement). Essential components of the basic food substances. Mineral components of food.	ОПК-8.1.1./з-1
6.	Physico- chemical properties of proteins . Molecular mass, the sizes and the form, solubility, ionization and hydratation, charge.	ОПК-8.1.1./з-1
7.	Lipid composition of membranes - phospholipids, glycolipids, cholesterol. Proteins of membranes - integral, peripheral, “anchored”. A role of different components of membranes in formation of structure and functions	ОПК-9.1.1./з-1
8.	Classification of proteins according to their solubility, chemical nature and biological function. Examples of representatives of certain classes.	ОПК-8.1.1./з-1
9.	Dietary lipids, their digestion. Absorption of the digested products. Resynthesis of triacylglycerols in a wall of intestines. Chylomicrons formation and transport of dietary lipids. The role of the lipoproteinlipase.	ОПК-8.1.1./з-1
10.	The basic carbohydrates of animals, a biological role. Carbohydrates of food, digestion of carbohydrates.	ОПК-8.1.1./з-1
11.	The structure of enzymes. Active and allosteric sites. Interaction of enzymes with ligands, "key –and- lock" model and “Induced fit” model for substrate binding.	ОПК-8.1.1./з-1
12.	Inhibition of enzyme activity: reversible and irreversible; competitive. Drugs acting as inhibitors.of enzyme activity.	ОПК-8.1.1./з-1
13.	Regulation of enzyme. Allosteric inhibitors and activators, cooperative changes quaternary structures of allosteric enzymes.	ОПК-9.1.1./з-1
14.	. Regulation of enzyme activity by covalent modification	ОПК-8.1.1./з-1

	(phosphorylation and dephosphorylation). Hormonal regulation of enzyme action.	
15.	Blood lipoproteins, classification, features of a structure. A role of each type of lipoproteins in transport of various kinds of lipids. Lecithin-cholesterol-acyltranferase, a biological role. Clinical significance of blood lipoproteins determination.	ОПК-8.1.1./з-1
16.	The major lipids of human tissues. Fats. Fatty acids of human tissues, structure features. Essential fatty acids. The essential components of dietary lipids for the human organism.	ОПК-8.1.1./з-1
17.	Importance of proteins in the human nutrition. Physiological protein minimum. Pool of amino acids in cells. Essential and nonessential amino acids. ·Nitrogen balance and it's biomedical importance.	ОПК-9.1.1./з-1
18.	Insulin, biosynthesis. A role of insulin and contrainsular hormones (adrenaline and glucagon) in regulation of a metabolism. Change of the hormonal status and metabolic abnormalities under a diabetes. Diabetic coma.	ОПК-8.1.1./з-1
19.	Endergonic and exergonic reactions in an alive cell. High energy phosphate compounds. Dehydrogenation of the substrate and oxidation of hydrogen as the basic energy source for synthesis ATP.	ОПК-8.1.1./з-1
20.	The concept of a gene in molecular biology. A biological code: the basic properties and characteristics. Features of structure tRNA, allowing it to execute a role of the adapter. Biosynthesis aminoacyl-tRNA. Aminoacyl-tRNA - synthetase, its specificity.	ОПК-8.1.1./з-1
21.	Protein digestion. The major enzymes for gastrointestinal protein and peptide degradation. Structure, properties, specificity and activation mechanisms of these enzymes.	ОПК-9.1.1./з-1
22.	Biological membranes, a structure and composition, functions and the general properties: fluidity, cross asymmetry, selective permeability.	ОПК-8.1.1./з-1
23.	Secondary and tertiary protein structures. Types of interactions between amino acid side chains in stabilizing the secondary and tertiary structures. Domain structure and its role in functioning proteins. Importance of chaperons (heat shock proteins) in Protein folding.	ОПК-8.1.1./з-1
24.	Factors affecting enzymatic reaction velocity. Effect of temperature, pH, concentration of enzyme and substrate on reaction velocity. Units of enzymatic activity measurements.	ОПК-8.1.1./з-1
25.	Blood glucose level as homeostatic parameter. A role of insulin, glucagon, adrenaline in the regulation of glucose	ОПК-8.1.1./з-1

	level. A role of adenylate cyclase signal transduction system in this process.	
26.	Hormones of a thyroid gland. Synthesis of thyroxine, its influence on a metabolism. Metabolic abnormalities under hypo- and hyperthyroidism. Endemic goiter.	ОПК-9.1.1./з-1
27.	Chemical structure and metabolic effects of hypothalamic and pituitary hormones. Feedback regulation of hormone synthesis.	ОПК-8.1.1./з-1
28.	Regulation of water and electrolyte homeostasis. Molecular structure, sources and effects of aldosterone and vasopressin. Renin-angiotensin regulatory system. Role of aldosterone in saliva formation.	ОПК-8.1.1./з-1
29.	Trycarboxylic acid cycle: a sequence of reactions and the characteristic of enzymes. A role of a cycle in a metabolism.	ОПК-8.1.1./з-1
30.	Biosynthesis of glucose from amino acids (gluconeogenesis), glycerol and lactate; regulation of the gluconeogenesis. Interrelation of the glycolysis in muscles and gluconeogenesis in a liver (Cori cycle).	ОПК-8.1.1./з-1
31.	Utilization of ammonia in the urea cycle - reactions, compartmentalization of the urea cycle enzymes, regulation, amount of urea excreted per day in the urine.	ОПК-8.1.1./з-1
32.	Catabolism of heme. Bilirubin detoxication, "direct" and "indirect" bilirubin. Jaundices: hepatocellular, hemolytic and obstructive.	ОПК-9.1.1./з-1
33.	Storage and mobilization of fats in an adipose tissue, a physiological role of the processes. Importance of insulin, adrenaline and glucagon in regulation of the lipid metabolism.	ОПК-9.1.1./з-1
34.	Degradation of fatty acids in a cell. Activation and transport of fatty acids into mitochondria. ß-oxidation of fatty acids, energy yields.	ОПК-8.1.1./з-1
35.	Transcription. Definition. Principles of transcription (complementarity, antiparallelity, unipolarity, asymmetricity). Stages of transcription. Structure of RNA polymerase: role of subunits ($\alpha 2\ \beta\beta'\sigma$). Initiation of this process. Elongation and termination of transcription.	ОПК-9.1.1./з-1
36.	The structural organization of the respiratory chain. NADH dehydrogenase. Cytochrome C reductase. Cytochrome C oxidase. Features of structure, functions. Coenzyme components of the mitochondrial electron transport chain.	ОПК-8.1.1./з-1
37.	Assembly polypeptide chain on a ribosome. The characteristic of stages initiation, elongation and termination. Peptidyltransferase activity of rRNA.	ОПК-9.1.1./з-1

38.	Hormone target cells. Signal transduction via membrane and intracellular receptors. Types of membrane receptors. Structure and function of G proteins.	ОПК-9.1.1./з-1
39.	Amino acid oxidative deamination and metabolic role of one. The types of amino acid oxidative deamination.	ОПК-8.1.1./з-1
40.	Amino acid transamination. Aminotrasferases and their structure and properties. Role of vitamin B_6 in amino acid transamination. Biological implication of amino acid transamination. Clinical significance of serum aminotransferases activity determination	ОПК-8.1.1./з-1
41.	Catabolism of the basic food substances in a cell - carbohydrates, fats, amino acids. Concept about specific and common pathways of catabolism.	ОПК-9.1.1./з-1
42.	The oxidative decarboxylation of the pyruvic acid: the characteristic of the process. The pyruvate dehydrogenase complex.	ОПК-9.1.1./з-1
43.	Aerobic oxidation of glucose in a cell. A sequence of reactions up to formation of the pyruvate (aerobic glycolysis). Physiological role of the aerobic oxidation.	ОПК-8.1.1./з-1
44.	Glycogen, the biological importance. Biosynthesis and mobilization of glycogen. Regulation of the formation and degradation of glycogen.	ОПК-9.1.1./з-1
45.	Metabolism of phenylalanine and tyrosine. Diseases eventuated from hereditary breakdowns of phenylalanine/tyrosine metabolism. Detection, evaluation and treatment of phenylketonuria, alcaptonuria and albinism.	ОПК-9.1.1./з-1
46.	Biosynthesis of fatty acids. The basic stages of process. Regulation of the fattty acids metabolism.	ОПК-9.1.1./з-1
47.	Biosynthesis of DNA (replication). Substrates, energy sources, a template, enzymes and proteins factors of replication. Stages of replication.	ОПК-9.1.1./з-1
48.	Biosynthesis and utilization of the ketone bodies. Ketone bodies as energy source. The course of ketosis at starvation and a diabetes.	ОПК-9.1.1./з-1
49.	Heme biosynthesis and its regulation. Infringements of synthesis heme (porfirias). An iron metabolism: absorption, transport, storage.	ОПК-8.1.1./з-1
50.	Anaerobic oxidation of glucose. Reactions of the glycolytic oxidoreduction; the substrate level phosphorylation. physiological role of the anaerobic oxidation of glucose.	ОПК-9.1.1./з-1
51.	Trycarboxylic acid cycle, summary of the process. Integration of a cycle with the electron transport chain. Regulation of the trycarboxylic acid cycle.	ОПК-9.1.1./з-1

52.	Trycarboxylic acid cycle. Anabolic and anaplerotic functions of the trycarboxylic acid cycle.	ОПК-9.1.1./з-1
53.	Transmembrane electrochemical potential as the intermediate form of energy at oxidative phosphorylation. H +-ATP-synthetase: biological role, localization, structure, mechanism of ATP synthesis. Mitchell's theory.	ОПК-8.1.1./з-1
54.	Proteins of bone tissue. Features, composition and structure of bone collagen type I. Osteonectin, osteocalcin, ostepontin and sialoprotein as mineralization regulators.	ОПК-8.1.1./з-1
55.	Enzymes of bone tissue. The role of alkaline phosphatase and pyrophosphatase in the mineralization of bone tissue. Stages of mineralization of bone and tooth tissues. Factors influencing on the processes of mineralization.	ОПК-8.1.1./з-1
56.	Functions of saliva. Physico-chemical properties, the daily amount of saliva. Mechanism and regulation of saliva formation.	ОПК-8.1.1./з-1
57.	Organic composition of saliva. Proteins of saliva: mucins, proteins rich in proline, statcherins, histatin, cystatin, cationic and anionic glycoproteins; their chemical composition and functions.	ОПК-8.1.1./з-1
58.	Mineral composition of saliva. Macro and microelements of saliva. The structure of calcium phosphate micelle. The role of oral fluid in the mineralization of tooth enamel.	ОПК-8.1.1./з-1
59.	Stages of bone tissue remodeling. Regulation of bone tissue remodeling and development.	ОПК-8.1.1./з-1
60.	The reasons and manifestations of a rickets, hypo- and hyperparathyroidism.	ОПК-8.1.1./з-1
61.	The structural organization intercellular matrix. Adhesive proteins intercellular matrix: structure and functions fibronectin and laminin.	ОПК-9.1.1./з-1
62.	Structure and functions of glycosaminoglycans (hyaluronic acid, chondroitin sulfate, heparan sulfate). Structure of proteoglycans.	ОПК-9.1.1./з-1
63.	Posttranslational processing (maturing) of initial polypeptide chains (partial cleavage, connection of nonprotein components, modification of amino acids) on an example of maturing of collagen	ОПК-9.1.1./з-1
64.	Polymorphism of collagen: fibreformation, associated with fibres, microfibred, "anchored" types of collagen, component of basal membrane.	ОПК-9.1.1./з-1
65.	Immunoglobulins, classes of immunoglobulins, features of a structure and functioning. Variety antigen - linkage sites H- and L-chains of immunoglobulins. Salivary immunoglobulin	ОПК-9.1.1./з-1

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66.	Structure and metabolism of tooth tissues. The structure of enamel. Formation of organic base of enamel.	ОПК-9.1.1./з-1
67.	Structure, composition and metabolism of tooth tissues: Dentine, Cement, Pulp.	ОПК-9.1.1./з-1
68.	Micro elements. The value for the life of the body, the biological significance for tooth tissues. The main sources for the body. Regional pathologies associated with lack of trace elements.	ОПК-8.1.1./з-1
69.	Protective and cleansing function of saliva. The role of immunoglobulins in saliva, lysozyme and mucin in protecting the oral cavity from bacterial infections. Structure and synthesis of lysozyme and mucin.	ОПК-8.1.1./з-1
70.	Collagen: Features of amino acids composition and sequence, primary and secondary structure. Interrelation of collagen structure and function. A role of an ascorbic acid in maturing collagen	ОПК-8.1.1./з-1
71.	Features of biosynthesis and maturing of collagen. A role of an ascorbic acid in maturing collagen.	ОПК-8.1.1./з-1
72.	Mineral substances of the human body. Macro elements, their role. Mineral components of food.	ОПК-8.1.1./з-1
73.	Mineralized tissues. The chemical composition of various tissues, the ratio of mineral and organic substances. Crystals of hydroxyapatite and fluorapatite, forming mineralized tissues. Stages of isomorphic substitution of elements of the crystal lattice and its role in the formation of apatite crystals.	ОПК-9.1.1./з-1
74.	Chemical structure and metabolic effects of parathyroid hormone.	ОПК-9.1.1./з-1
75.	Macro element Ca The value for the life of the body, the biological significance for tooth tissues. The main sources for the body. Mechanisms of hormonal signal transduction by calcium via phosphatidylinositol pathway.	ОПК-8.1.1./з-1
76.	Macro elements. P The value for the life of the body, the biological significance for tooth tissues. The main sources for the body	ОПК-9.1.1./з-1
77.	Vitamins, a biological role. Classification of vitamins, examples. Hyper-, hypo-, and avitaminosises, the reasons of occurrence. Vitamin C.	ОПК-9.1.1./з-1
78.	Coenzyme functions of vitamins (on an example of transaminases and dehydrogenases, vitamins B_6, PP). The role of vitamins PP, B6 and the enzyme lysyl oxidase in the formation of collagen fibrils.	ОПК-8.1.1./з-1
79.	Composition and function of connective tissues.	ОПК-9.1.1./з-1
80.	The scheme of cholesterol biosynthesis. Mevalonic acid	ОПК-9.1.1./з-1

	formation is key reaction in the cholesterol metabolism. β-Hydroxy-β-methylglutaric acid-CoA reductase and regulation of its biosynthesis and activity. Role of cholesterol in cholic acids biosynthesis. Excretion of cholesterol and cholic acids.	
81.	Regulation of absorption, storage and release of calcium ions	ОПК-9.1.1./з-1
82.	Mechanism and biological role of amino acid decarboxylation. Structure and function of biogenic amines such as histamine, serotonin, GABA. Inactivation of biogenic amines via deamination, or methylation	ОПК-8.1.1./з-1
83.	Chemical structure and metabolic effects of calcitonin and calcitriol.	ОПК-9.1.1./з-1
84.	Enzymes. Features of enzymatic catalysis. Enzyme specificity. Classification and the nomenclature of enzymes.	ОПК-9.1.1./з-1

The full fund of assessment tools for discipline in the EIES of VolgSMU at the link (s):

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Considered at the meeting of the department of "29" _may_ 2025, protocol No 12

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