Документ подписан простой электронной подписью
Информация о владельце:
ФИО: Стегний Кирилл Владимирович
Должность: И.о. ректора
Дата подписания: 27.03.2026 13:46:31
Уникальный программный ключ:
d59234ba928aea5c04c54eb9013e367220b6b2ae

Federal State Budget Educational Institution
of Higher Education
Pacific State Medical University
of the Ministry of Health of the Russian Federation

APPROVED BY
Director of the Institute of
Fundamentals and Information
Technologies in Medicine
_____ / Bagryantsev V.N./
"4th" of April 2025

COLLECTION OF ASSESSMENT TOOLS
Б1.О.06 Chemistry
of the basic educational program
of Higher Education

Specialty	**31.05.03 Dentistry** **for international students (in English)** (code, name)
Degree	Specialist's degree
Profile	02 "Healthcare" (in the field of providing health care in patients with dental pathology)
Mode of study	**Full-time**
Period of mastering the BEP	**5 years** (nominal length of study)
Institute	of Fundamentals and Information Technologies in Medicine

Vladivostok, 2025

1. INTRODUCTION

1.1. **Collection of Assessment Tools** is a document that regulates the format, content, and types of assessment tools for continuous assessment, interim examination and final (state final) examination, and graded criteria for each type of assessment tools.

1.2. Assessment tools allows to evaluate the development of universal, general professional, and professional competencies (UCs, GPCs and PCs respectively) outlined in Federal State Educational Standard of Higher Education and defined in the basic educational program of higher education for the specialty 31.05.03 Dentistry for international students (in English), profile 02 "Healthcare" (in the field of providing health care in patients with dental pathology).

(BEP HE for the 31.05.03 Dentistry for international students (in English) specialty, section 3 Learning Outcomes Requirements of the Basic Educational Program of Higher Education)

2. DOCUMENT BODY

2.1. Types of Assessment, Formats of Assessment Tools

No.	**Types of assessment**	**Assessment Tools Format**
1	**Continuous assessment**	**Tests**
		Checklists
		Laboratory class reports
2	**Interim assessment**	**Tests**
		Interview Questions

3. The contents of assessment tools for continuous and interim examination are prepared by the teacher of the course

Tests for continuous and interim assessment

	Code	**Competence description / name of labor function / name of work activity / text**
S	31.05.03	Dentistry for international students (in English)
C	GPC-8	Is able to use basic concepts and methods of physics, chemistry, mathematics and natural sciences when working to achieve objectives of professional activities
I		**ANSWER LEVEL 1 TEST QUESTIONS (ONE CORRECT ANSWER)**
		1. IN THE CURRENTLY USED ELECTRONIC, PROTOLYTIC AND THEORY OF ELECTROLYTIC DISSOCIATION, DIFFERENT INTERPRETATIONS OF THE CONCEPT OF "BASE" ARE GIVEN. HOWEVER, THE ANALYSIS OF THE CONCEPTS REVEALS THEIR SIMILARITY, WHICH IS ASSOCIATED +a) with the presence of the OH group b) with the presence of an element with low electronegativity c) with the presence of an electron pair d) with the presence of a proton **2. THE ANALYSIS OF THE CONCEPTS OF "BASE" AND "ACID" ALLOWS US TO CONCLUDE THAT IN**

		AN AQUEOUS SOLUTION OF ACETIC ACID a) a salt is formed +b) a conjugated acid–base pair is formed c) the acid completely passes into the base d) the acid remains unchanged **3. ANALYSIS OF THE DETERMINATION METHOD ALLOWS US TO ESTABLISH THE PHYSICAL MEANING OF THE TITRATED ACIDITY OF A BIOFLUID AS** +a) c (acids), including Brensted acids b) c (acids) c) c (acids) determined by titration d) c (H+) **4. THE ANALYSIS OF THE PROTOLYTIC THEORY REVEALS THAT THE BASIC FUNCTION OF A BUFFER SYSTEM CAN BE PERFORMED IF ITS MANDATORY COMPONENTS ARE** a) a weak protolyte and an excess of its salt with a weak protolyte b) a weak protolyte and an excess of its salt with a strong protolyte c) a weak protolyte and its salt with a weak protolyte +d) a weak protolyte and its salt with a strong protolyte **5. THE MANIFESTATION OF BUFFERING PROPERTIES WITH AN AQUEOUS SOLUTION OF PROPANOIC ACID, BASED ON THE DEFINITION, IS** +a) impossible, because there is no second component b) possible, because a conjugated acid-base pair is formed c) impossible, because the concentration of the acid-base pair base is small d) impossible, because C_2H_5 – COOH is a strong protolyte

Assessment criteria
"Very good" – over 80% correct answers of questions of every level
"Good" – 70-89% correct answers of questions of every level
"Satisfactory" – 55-69% correct answers of questions of every level
"Unsatisfactory" – less than 55% correct answers of questions of every level

Interview questions

	Code	**Competence description / name of labor function / name of work activity / text**
S	31.05.03	Dentistry for international students (in English)
C	GPC-8	Is able to use basic concepts and methods of physics, chemistry, mathematics and natural sciences when working to achieve objectives of professional activities
I		**ANSWER THE QUESTIONS** 1. Acids and bases. Protolytic theory of acids and bases. Conjugated protolytic pair. 2. Types of Brensted-Lauri acids and bases (molecular, ionic, and ampholytic). 3. Autoprotolysis. The ionic product of water. 4. The hydrogen index (pH) of solutions. Active acidity (AA).

		Methods of its definition. 5. Titratable acidity (TA), potential acidity (PA), total acidity (TA). Ways to determine them. 6. Types of protolytic reactions: ionization of weak acids and bases. Constants of acidity and basicity. The relationship between constants in a conjugated protolytic pair. 7. Types of protolytic reactions: salt hydrolysis. Degree and constant of hydrolysis. Factors that enhance hydrolysis. 8. Electronic theory of Lewis acids and bases. 9. Isolated protolytic equilibrium in buffer systems. Types of buffer systems. 10. Calculation of the pH of buffer systems (the Henderson-Hasselbach equation). 11. The mechanism of action of buffer systems. 12. Buffer capacity. Factors affecting the size of the buffer capacity. The buffer zone. 13. Blood buffer systems: bicarbonate, phosphate, hemoglobin, protein. 14. Combined protolytic equilibrium: competition for a proton. The concept of the acid-base state of the body. 15. Isolated heterogeneous equilibrium. The solubility constant. Forecasting the direction of precipitation reactions. 16. Conditions affecting the formation and dissolution of precipitation (mononymous and heterogeneous ions, pH). The rule of transferring one insoluble substance to another. 17. The phenomenon of isomorphism and its role in life. 18. Combined heterogeneous equilibria. The constant of combined heterogeneous equilibrium. 19. The structure and nature of chemical bonds in complex compounds. Hybridization of the orbitals of the complexing agent and its relation to the spatial structure of the complex compound. 20. The concept of the structure of intraorbital and external orbital, high-spin (spin-free) and low-spin (spin-paired) complexes. 21. The "power" of ligands. The concept of dental ligands and their ability to form chelates. 22. Classification of complex compounds: chelates, polynuclear complexes, macrocyclic complexes. 23. Stability of complex compounds in solutions. The instability constant of a complex compound. 24. Combined ligand-exchange equilibria. The constant of combined ligand exchange equilibrium. 25. Toxic effect of heavy metals. Antidotes. 26. Inert and labile complexes. 27. Nomenclature of complex compounds. 28. Redox potential as a quantitative measure of oxidizer strength. 29. The Nernst-Peters equation; factors influencing the value of the redox potential. 30. Forecasting the direction of redox processes by the values of redox potentials. 31. Advantages and limitations of thermodynamics. 32. Basic concepts of thermodynamics: system, types of

		thermodynamic systems, state of the system. State functions: internal energy, enthalpy, entropy, Gibbs energy (isobaric-isothermal potential). 33. The first principle of thermodynamics as applied to chemical reactions. Hess's law. 34. Standard enthalpies of formation and combustion of substances. Consequences of Hess's law. The Lavoisier-Laplace law. 35. The second principle of thermodynamics. Entropy. Standard entropy. The statistical nature of entropy. 36. Methods of calculating entropy. Forecasting the direction of processes in an isolated system. 37. Gibbs energy. The physical meaning of Gibbs energy. The Gibbs equation. 38. Gibbs standard energy. Payment methods. 39. The universality of free energy. The role of entropy and enthalpy factors. Forecasting the direction of processes in a closed system. 40. The concept of exergonic and endergonic exchange reactions. The principle of energy coupling. Macroergies. 41. Chemical equilibrium. Thermodynamic equilibrium conditions in isolated and closed systems. 42. The chemical equilibrium constant. 43. Prediction of chemical equilibrium. Equations of isotherms and isobars of a chemical reaction. Their analysis. 44. Reaction speed and factors influencing it. The law of the acting masses. The reaction rate constant. 45. The molecular nature and order of the reaction. Methods for determining the reaction order, rate, and rate constant. 46. Kinetic equations of 0,1,2 orders. The period of semi-conversion. 47. The dependence of the reaction rate on temperature. The Van't Hoff rule. The temperature coefficient of the reaction rate and its features for biochemical processes. 48. The concept of the theory of active collisions. Activation energy. The Arrhenius equation; methods for calculating the activation energy. 49. Catalysis. Types of catalysis. Features of the catalytic activity of enzymes. The mechanism of action of enzymes. Inhibition of enzymes. 50. The Michaelis-Menten equation and its analysis.

Assessment criteria
"Very good" – over 80% correct answers of questions of every level
"Good" – 70-89% correct answers of questions of every level
"Satisfactory" – 55-69% correct answers of questions of every level
"Unsatisfactory" – less than 55% correct answers of questions of every level

Standardized case studies and checklists for the **Б1.О.06 Chemistry** course

Case Study No.1

	Code	**Competence description / name of labor function / name of work activity / text**
S	31.05.03	Dentistry for international students (in English)
C	GPC-8	Is able to use basic concepts and methods of physics, chemistry,

		mathematics and natural sciences when working to achieve objectives of professional activities
I		**READ THE PROVIDED CASE DESCRIPTION AND GIVE DETAILED ANSWERS TO THE QUESTIONS**
		Silver compounds have bactericidal, pronounced antifungal and antiseptic effects and serve as a highly effective disinfectant against pathogenic microorganisms that cause infections. Thus, the compound $[Ag(NH_3)_2]Cl$ belongs to the group of bactericidal agents, which is used as an external agent
Q	1	Question: Give a brief description of this complex (name, type of hybridization, types of bonds in the complex). 2. Give possible reactions of formation of $[Ag(NH_3)_2]Cl$.3. Specify the conditions conducive to the formation of a solid complex.

Case Study No.1 Checklist

	Code	**Competence description / name of labor function / name of work activity / text**
S	31.05.03	Dentistry for international students (in English)
C	GPC-8	Is able to use basic concepts and methods of physics, chemistry, mathematics and natural sciences when working to achieve objectives of professional activities
I		**READ THE PROVIDED CASE DESCRIPTION AND GIVE DETAILED ANSWERS TO THE QUESTIONS**
		Silver compounds have bactericidal, pronounced antifungal and antiseptic effects and serve as a highly effective disinfectant against pathogenic microorganisms that cause infections. Thus, the compound $[Ag(NH_3)_2]Cl$ belongs to the group of bactericidal agents, which is used as an external agent
Q	1	Question: Give a brief description of this complex (name, type of hybridization, types of bonds in the complex)
A		Correct answer 1. Diamminesilver(I) chloride 2.Sp 3. Ionic, donor-acceptor
R2	Very good	Full answer given (points 1, 2, 3 are given)
R1	Good/Satisfactory	Incomplete answer given (“Good” grade – points 1 and 3 are given “Satisfactory” grade – point 1 is given)
R0	Fail	Incorrect answer given (no answer given)

4. Assessment criteria for learning outcomes

For graded test:

"Very good" grade is given to a student who possesses knowledge of the subject in full scope outlined in the curriculum, has a sufficiently deep insight into the subject; is able to answer all questions clearly, exhaustively, and with no outside help; structures their answers logically, with emphasis on the most important information; is able to analyze, compare, classify, summarize, refine, and structure the course content, giving particular attention to cause-and-effect relationships.

Test results: over 91% correct answers of questions of every level

"Good" is given to a student whose knowledge of the subject is almost in full scope outlined in the curriculum (gaps are only present in the knowledge of some especially complex aspects); is able to answer questions exhaustively with little to no outside help; does not always put emphasis on the most important information, but does not make significant mistakes.

Test results: 81-90% correct answers of questions of every level

"Satisfactory" is given to a student who possesses the bulk of knowledge on the subject; has difficulties answering questions with no outside help, uses imprecise wording; makes mistakes in substantial number of their answers.

Test results: 71-80% correct answers of questions of every level

"Unsatisfactory" is given to a student who does not have the mandatory minimum of knowledge on the subject, is not able to give an answer even with additional guiding questions.

Test results: less than 71% correct answers of questions of every level

Appendix 1

Practical Skills Assessment Checklist

Practical Skill Name "Determining the titratable acidity of a biofluid"

C	GPC-8	Is able to use basic concepts and methods of physics, chemistry, mathematics and natural sciences when working to achieve objectives of professional activities		
WA	Work activities as part of the function Is able to use basic concepts and methods of physics, chemistry, mathematics and natural sciences when working to achieve objectives of professional activities			
	Action		Performed	Not Performed
1.	Selecting laboratory measuring glassware		1 point	-1 point
2.	Selecting a standard and an indicator		1 point	-1 point
3.	Performing titration		1 point	-1 point
4.	Processing obtained results		1 point	-1 point
5.	Interpreting the result		1 point	-1 point
	Total		5 points	

Assessment criteria:

"Pass" –75% or more of actions performed correctly

"Fail" – 74% and less