QUESTIONS FOR INDIVIDUAL WORK

№	*Theme*	*Hours*
	Module 1	
1	**Studies of V.I. Vernadskiy about biosphere. Biogeochemical provinces. Problems of contamination of biosphere.**	2
2	**Biogenic s - elements: chemical properties, biological role, uses in medicine.**	2
3	**Biogenic p - elements: chemical properties, biological role, uses in medicine.**	2
4	**Biogenic d - elements: chemical properties, biological role, uses in medicine.**	2
5	**Nature of chemical connections and spatial structure of complex connection.**	2
6	**Quantitative composition of solutions. Chemical tableware**	2
7	**Volumetric analysis. Method of acid-base titrations. Alkalimetry. Acidemetry.**	2
8	**Acid-base equilibrium in the organism. pH scale of biological liquids.**	2
9	**Buffer systems: classification, mechanism of the action. Acid-base equilibrium in the organism.**	4
10	**Colligative properties of solutions. Cryometry.**	2
	At all	26
	Module 2	
11	**Thermal effects of the chemical direction of the processes.**	2
12	**Kinetics of biochemical reactions.**	2
13	**Chemical equilibrium. Solubility product. Heterogenous equilibrium.**	2
14	**Potenciometric method of analysis. Determination of oxidation-reduction (redox) potential.**	2
15	**Sorbtion of biological active compounds on the layer liquid – gas and ion exchange in biological systems.**	
16	**Sorbtion of biological active compounds on the layer solid compound - solution and gel filtration. Immunology sorbent.**	2
17	**Ion exchange. Chromatography.**	2
18	**Preparation, purification and properties of colloidal solutions.**	2
19	**Aerosols, suspension, powders.**	2
20	**Physicochemical properties of biopolymers solutions. Colloidal stability.**	2
	At all	24

List of questions for preparation of students for final module control - differential test from the module «Basics of medical chemistry»

Content module 1. Homogeneous equilibrium in biological liquids

1. Biogenic elements: their electronic structure; typical chemical properties of elements and their connections – acid – basic, oxidation – reduction, complex formation. Connection between the location of s-, p-, d-elements in the periodic system and their maintenance in the organism of man. Macro-, micro- and admixture of elements in the organism of man. Application in medicine. Toxic action of connections.
2. Complex connections: theory of Werner, nature of chemical connection, classification, inside complex connections. Complex connections in the biological systems. Complex ions and their application in medicine.
3. Solutions in vital functions.
4. Solubility of gases in liquids and its dependence on different factors. Law of Henry – Dalton. Solubility of gases in blood.
5. Solubility of hard matters and liquids, dependence on different factors. Distribution of matter between two liquids which are notmixed. Nernst distributing law and his value in the phenomenon of permeability of biological membranes.
6. Solutions of electrolytes. Ostwald's breeding law. Properties of solutions of strong electrolytes, activity and coefficient of activity. Ionic force of solution. Water-electrolyte balance - necessary condition of homeostasis.
7. Dissociation of water. Ionic product of water. pH-value of pH solutions of strong and weak electrolytes. pH of biological liquids in a norm and pathology.
8. Acid-base theory. Types of protolitic reactions. Hydrolysis of salts, degree of hydrolysis, dependence on concentration and temperature, constant of hydrolysis. The role of hydrolysis in biochemical processes.
9. Methods of titrimetric analysis. Method of acid–base titration: alkali- and acidimetry, their description. Acid-base indicators.
10. The buffer systems, their classification, mechanism of action, basic equalization, Henderson-Hasselbach equation . Buffer capacity, practical determination. Buffer capacity of blood. Buffer systems of organism of man, their mechanism of action. Acid-base equilibrium and alkaline reserve of blood.
11. Colligative properties of solutions. Decline of temperature of freezing and increase of temperature of boiling of solutions. Raul's laws. Cryometry and ebulliometry, their application in medico-biologic researches.
12. Osmosis, semi-permeable membranes, osmolality. Law of Shrouds - Gofa and his equalization for nonelectrolytes and electrolytes. Isotonic coefficient. Solution definition: hyper-, hypo-, isotonic solutions. Plasmolysis, hemolysis, turgor.
13. A role of osmosis in the biological systems. Osmolality of plasma of blood.

Gallers equalization. Oncotic pressure. Application of osmometry in medico–biological researches.

Content module 2. Heterogeneous equilibrium in biological liquids

1. First law of thermodynamics. Internal energy. Enthalpy. Warmth of isobar and isochoric processes.
2. Thermochemistry. Law of Hess. Thermo-chemical transformations. Standard heat of formation and combustion of matters.
3. Second law of thermodynamics.Entropy. Energy of Gibbs.
4. Chemical equilibrium. Thermodynamics terms of equilibrium. Prognosis of direction of arbitrary processes. Exergonic and endergonic processes which take place in an organism. Heterogeneous equilibrium in oral cavity.
5. Constant of chemical equilibrium. Methods of expression. Le Chatelier's principle. Prognosis of displacement of chemical equilibrium.
6. Speed of chemical reactions. A law of operating masses for speed of chemical reactions. Reaction rate constant.
7. Reactions simple and complex (successive, parallel, conjunction, circulating, chain). Actinic reactions and their role in vital functions.
8. Order of reaction. A zero, 1st and 2nd order reactions. Period of semi-transformation.
9. Dependence of speed of reaction on temperature. Temperature coefficient. Shrouds – Goffa rule. Features of temperature in the coefficient of speed of reaction in biochemical processes.
10. Arrhenius equalization. Energy of activation. Concept of the theory of active collisions and the theory of transitional state.
11. Homogeneous and heterogeneous catalysis. Features of action of a catalyst. Mechanism of catalysis and its role in the processes of metabolism.
12. Enzymes as catalysts of biochemical reactions. Dependence of fermentative action on the concentration of enzyme and substrate, temperatures and reactions of environment.
13. Macroergic connections. ATP as universal energy source for biochemical reaction. Description of macroergic connections.

Reactions of besieging and dissolutions. Work of solubility. Terms of fall and dissolution of fallouts. Role of heterogeneous equilibrium with participation of salts in the general homeostasis of organism

14. Electrode potentials and mechanism of their origin. Nernst's equalization. Normal (standard) electrode potential. Electrodes determination.

List of practical works and tasks for final control from the module 1,2

1. To explain chemical properties of s, p, d-elements and their bonds.
2. To interprete high-quality reactions on s, p, d-elements.
3. To explain the structure of complex bonds, determine the charge of complex fomation, coordinating number.
4. To interpret principles of formation of complex bonds and to explain their constants of stability and instability.
5. To expect mass part of matter in solution, molar concentration and molar concentration of equivalent solutions.
6. To calculate pH solutions of strong and weak electrolytes.
7. To determine pH solutions by the method of calorimetery.
8. To calculate pH of the buffer systems, correlation of volumes of components and change of pH of the buffer systems as a result of addition of acids and bases.
9. To explain principles of preparation of buffer solutions with the set values of pH.
10. To calculate the buffer capacity of acid and base solutions.
11. To interpret principles of determination of buffer capacity by way of blood acid and base and explain the results.
12. To explain the osmolality of solutions, osmotic concentration, depression of solutions
13. To analyse the ways of reception of semi-permeable membranes.
14. To explain osmotic processes in blood cells.
15. To explain the thermal effects of reactions, entropy, energy of Gibss.
16. To find orientation of chemical reactions.
17. To interpret principle of determination of thermal effect of reactions of neutralization.
18. To explain speed of chemical reactions, temperature coefficient, work of solubility and constant equilibrium.
19. To determine direction of displacement of chemical equilibrium in chemical reactions.
20. To estimate influence of concentration of reactive matters and temperature on speed of chemical reactions.
21. To explain the pH of solutions from data of helipot.
22. To determine pH by a pH –meter.
23. To calculate redox potential by Peters equalization.
24. To identify matter by the size of Rf .
25. To explain the structure of micelle of colloid solutions.
26. To estimate the threshold of coagulation.
27. To determine the isoelectric point of HMC.
28. To analyse influence of electrolytes, pH and temperatures on stability of HMC and swelling degree.