**Topic 7. OLYGO-AND POLYSACCHARIDES, STRUCTURE AND CHEMICAL PROPERTIES.**

**1. Actuality of the topic:** combined hydrocarbons are spread in nature, olygo- and polysaccharides are among them. These hydrocarbons are contained in the cytomembranes, and they are also the source of energy in the organism (starch and glycogen). Some of them are used as blood substitutes (polyglycine), as loading of powders and tablets

**2. General aim**: to make conclusions about reactivity of combined hydrocarbons according to their structure and contents.

**3. Actual aims and abilities:**

To interpret the specialties of structure and conversion of oligosaccharides in Human organism.

To interpret the specialties of structure and conversion of homopolysaccharides in human organism as of energy source for living processes.

To explain the mechanism of heteropolysaccharides biological role in human organism.

**4. Literature:**

4.1. Lecture.

4.2. Zurabyan S.E. Fundamentals of bioorganic chemistry, Moscow, 2004, pp. 225-238.

**5. The main questions of the seminar:**

5.1. What disaccharides are. Classification of disaccharides according to their ability to oxydative-reductive reactions.

5.2. Saccharose structure, lactose structure: reductive abellies and oxy-groups (helates appearance, alkylation, acetylation).

5.3. Homopolysaccharides: starch, glycogen, cellulose, dextranes: composition, structure, primary and secondary structure, chemical properties, biological meaning.

**6. The questions for individual learning:**

6.1. Starch hydrolysis, qualitative reaction for starch determination.

6.2. Heteropolysaccharides: hyaluronic acid, heparin, chondroitin sulfate, their composition and the structure of disaccharide fragment, biological meaning.

**7. Examples of tasks:**

7. What are homopolysaccharides (examples)?

**8. Homework (must be performed in the laboratory notebook)**

8.1. Write the structural formula of lactose, show the bond type between two monosaccharide units.

8.2. Write the structure of cellulose disaccharide fragment and show the bond type between two monosaccharide units.

**9. Examples of control test:**

9.1. Write the structure of galactose and the scheme of its hydrolysis. What compounds are the reductors in this reaction?

9.2. Write the structure of disaccharide fragment of glucose and show the bond type.

9.3. Write the structure of completely acetylated disaccharide fragment of amilose.

Lactose, glucose and galactose are the reductors.

**10. Laboratory work.**

**The algorithm of the experiments:**

1. Demonstration of the presence of hydroxyle groups in saccharose.

2. Demonstration of absence of reductive abilities in saccharose.

3. Demonstration of saccharose hydrolysis.

4. Presence of reductive abilities in lactose.

5. Acidic hydrolysis of starch.

**Detailed description of experiment**:

***Experiment 1.* Demonstration of the presence of hydroxyle groups in saccharose.**

Put 1 drop of saccharose solution and 6 drops of NaOH solution, 5-6 drops of water and 1 drop of copper sulfate solution in to the test-tube. Mark the results, write the reaction equation and make conclusions.

***Experiment 2.* Demonstration of absence of reducing properties in saccharose.**

The solution received in the first experiment must be heated until boiling.

Mark the results, make the conclusions.

***Experiment 3.***. **Demonstration of saccharose hydrolysis.**

Put 1 drop of saccharose solution and 1 drop of HCl solution, 6 drops of water into a test-tube and boil for 1min. Hydrolysed solution put into two test-tubes. Add 6 drops of NaOH solution, 4-5 drops of water and 1 drop of CuSO4 solution in to the first one and heat until boiling. Put the resorcinol crystal, 2 drops of HCl concentrated into the second one and heat until boiling. Mark the results, write the scheme and make the conclusions.

***Experiment 4.*** **The reducing abilities of lactose.**

Put 1 drop of lactose solution, 4 drops of NaOH solution, 1 drop of CuSO4 solution and heat until boiling. Mark the results, write the reaction equations and make conclusions.

***Experiment 5.*** **Acidic hydrolysis of starch.**

Put 1 drop of starch gleu, 2 drops of sulfuric acid in the test-tube and put the test-tube into the boiling water. After 20 and 40 min. Make the qualitative reaction on the starch with one drop of hydrolysed solution. Mark the results, write the scheme of starch hydrolysis and make conclusions.