

SUMY STATE UNIVERSITY

The laboratory journal

Medical Chemistry

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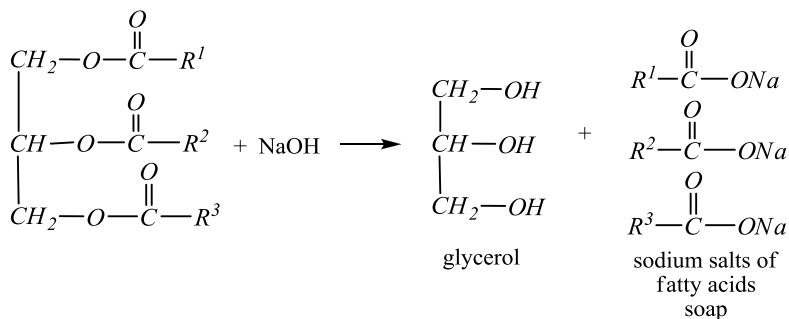
LABORATORY WORK № 5

Lipids

- Purposes:**
1. To make the test for double bonds in the fatty acid components of lipids.
 2. To obtain a soap by saponification reaction.
 3. To write the general formulas of lipids and soaps.

The chemical properties of triacylglycerols are explained by the presence ester and C=C functional groups. The ester group undergoes hydrolysis while the C=C undergoes addition reactions.

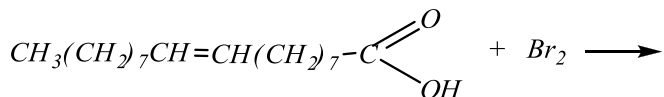
The hydrolysis of an ester in a basic solution is called saponification.



Soaps are sodium or potassium salts of fatty acids.

Experiment 1. *Test for double bonds in the fatty acid components of lipids*

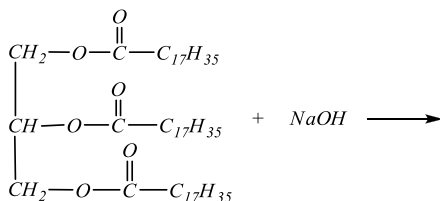
Place 8-10 drops Br_2 water in a test-tube and add 2-3 drops of oil. Shake the test-tube observe the change of the coloring. Write equation for addition of Br_2 to the oleic acid.



Experiment 2. *Saponification of lipids*

Place 0.5 cm³ oil in an evaporating basin and add 4 drops of NaOH solution. Stir up the mixture by glass stick. Heat. Add 2 cm³ distilled water. Heat and mix. Obtain the soap.

Write the equation for the saponification of the tristearin



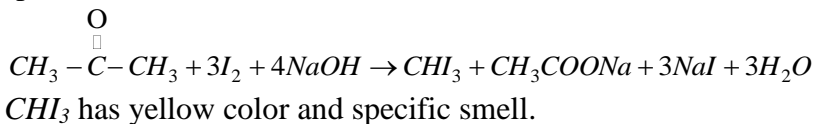
LABORATORY WORK № 6

Poly- and Heterofunctional compounds

Purposes: To acquaint with the chemical properties of poly- and heterofunctional compounds.

Experiment 1. *Test for ketone bodies*

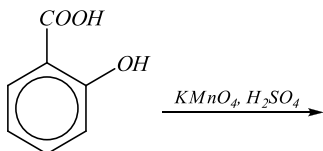
Place 1 cm³ of acetone into a test-tube. Add 2-3 drops of *Lugol* (Люголь) solution; add 2-3 drops of 10% NaOH solution. Observe the change of the coloring and smell the specific odor.



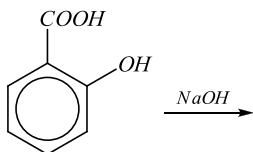
Experiment 2. *Properties of o-hydroxybenzoic acid (salicylic acid)*

Take 4 test-tube. Place 2-3 crystals into each test-tube.

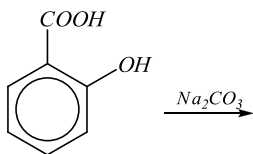
- 1) Add 1-2 drops of H_2SO_4 solution and 1-2 drops of $KMnO_4$ solution into the first test-tube. Observe the change of the coloring. Write the reaction equation.



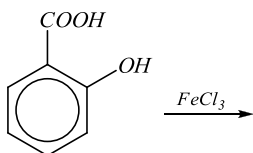
- 2) Add 2-3 drops of $NaOH$ solution into the second one



- 3) Add 4-5 drops of Na_2CO_3 solution into the 3-th test-tube



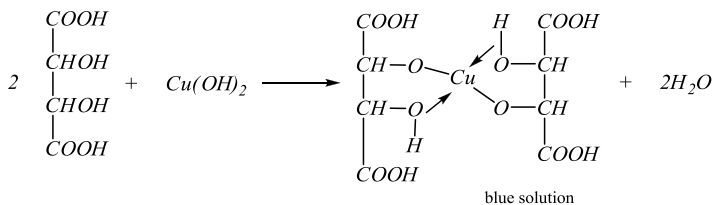
- 4) Add 1-2 drops of $FeCl_3$ solution into the 4-th rest-tube



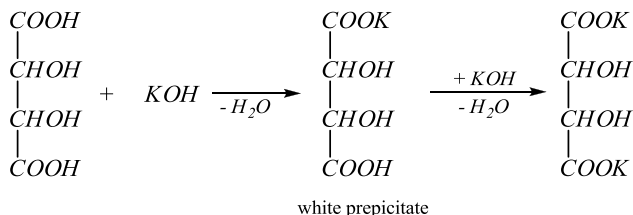
Experiment 3. *Properties of polyalcohol*

Take two test-tube. Place 2-3 drops of tartar acid solution.

- 1) Add 2-3 drops of 10% NaOH solution and 2-3 drops of 2% CuSO_4 solution into the first test-tube.



- 2) In the second test-tube add 1-2 drops of KOH . Observe the formation of white precipitate. Add 5-6 drops of KOH solution. Precipitate will be dissolved in the excess of KOH .

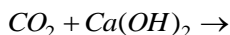
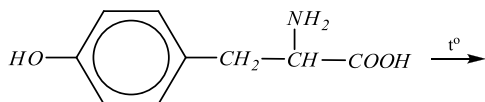


LABORATORY WORK № 7

Amino acids and Proteins

1. Formation of amines by decarboxylation. Decarboxylation of tyrosine.

Put 3-4 drops of tyrosine solution into a test-tube; add 1 ml of $\text{Ca}(\text{OH})_2$ solution. Observe the cloudiness. Heat the test-tube. Observe the appearance of precipitate.



2. *Lead acetate test* (Unoxidized sulfur test)

Put 1-2 ml of oxytacin, 2-3 drops of lead acetate solution, 5-7 drops 30% *NaOH* solution. Stir up and heat the test-tube for 5 minute. Observe the appearance of black or brown precipitate of *PbS*.

3. *Specific colour reactions*

a) *Reaction with ninhydrin*

Put 5-7 drops of insulin, 4-5 drops of ninhydrin. Stir up and heat the test-tube. Observe the change of the coloring.

b) *Biuretov's reaction*

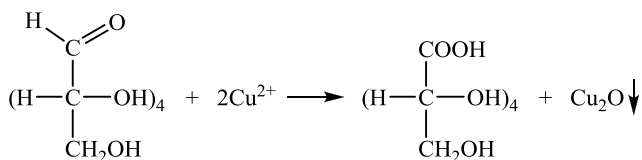
Put 1 ml of insulin, 1 ml 10% *NaOH* solution, 2-3 drops *CuSO*₄. A purple-violet colour is obtained.

LABORATORY WORK № 8

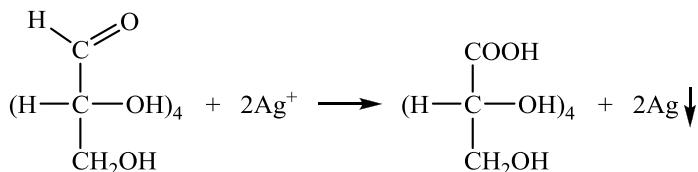
Properties of Carbohydrates

Experiment 1. *Properties of monosaccharides*

Benedict's and Feeling's reagents are alkaline solutions which contain copper (II) complex ions that act as oxidizing agents (Feeling's solution contains a cupric tartrate complex ion). The appropriate reagent is mixed with blood plasma or urine containing D-glucose. Under conditions of heating the aldehyde group of monosaccharide is oxidized to a carboxylic acid, while the copper (II) ions reduced to copper (I) oxide, *Cu*₂*O*, which makes brick-red precipitate.



Tollen's reagent is a solution, which contains complex ion of silver, and namely ammoniacal silver nitrate $[\text{Ag}(\text{NH}_3)_2]\text{OH}$ in the presence of aldehyde silver (I) ion are reduced to metallic silver that gives "silver mirror effect":



1.1 Benedict's reaction

Take test-tube. Put 5-6 drops of 0.5% glucose solution. Add 6-7 drops of 10% NaOH solution and 2-3 drops of 2% CuSO_4 solution. Heat the test-tube. Observe the change of the coloring in test-tube.

1.2 Feeling's reaction

Put 5-6 drops of 1% glucose solution and add 5-6 drops of Feeling's reagent. Heat the test-tube.

1.3 Tollen's reaction

Put 4-5 drops of 0.5% solution of glucose solution. Add 4-5 drops $[\text{Ag}(\text{NH}_3)_2]\text{OH}$. Heat.

Experiment 2. Properties of fructose

Put 3-4 drops of fructose solution. Add 3-4 drops HCL(conc.) and 3-4 crystals of resorcinum. Heat.

Experiment 3. *Properties of sucrose*

Put 2-3 drops of sucrose solution, 5-6 drops of NaOH and 2-3 drops of CuSO_4 . Heat.

Experiment 4. *Properties of lactose*

Put 2-3 drops of lactose solution, 4-5 drops of NaOH solution. Add 2-3 drops of CuSO_4 . Heat.

Experiment 5. *The acid hydrolysis of starch*

Put 2 ml of starch solution, add 15 drops of H_2SO_4 . Heat solution for 5-10 minutes. Add 1 drops I_2 solution.

LABORATORY WORK №9

Heterocyclic compounds.

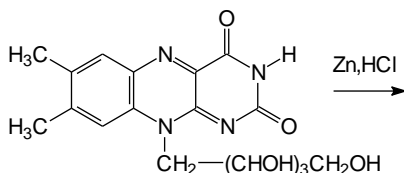
Purposes: To acquaint with the chemical properties of heterocyclic compounds.

Experiment 1. *Oxidation – redaction properties of heterocyclic compounds.*

a) Test for vitamin B₂

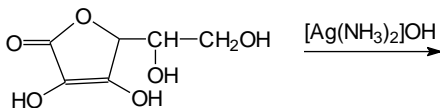
Place 5-8 drops of 0,025% vitamin B₂ solution into test-tube, add 3-5 drops of HCl and the piece of Zn.

Observe the change of the coloring.



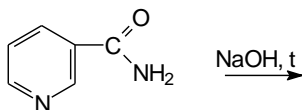
b) Test for vitamin C

Place 5-8 drops of vitamin C solution into test-tube. Add 1-2 drops solution of $[\text{Ag}(\text{NH}_3)_2]\text{OH}$. Observe the change of the coloring.



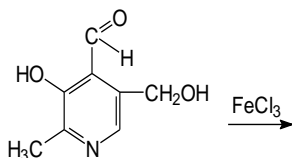
Experiment 2. *Test for vitamin PP.*

Place 2-3 ml of vitamin PP solution into a test-tube. Add 5-6 ml of 2N solution NaOH. Heat. Smell the specific odor.



Experiment 3. *Properties of $-OH$ groups in heterocyclic compounds. Test for vitamins of B_6 group's.*

Place 5-6 drops of 1% vitamin B_6 solution into test-tube. Add 4-5 drops 1% $FeCl_3$ solution. Observe the change of the coloring.



Experiment 4. *Acidic properties of uric acid.*

Place 5-6 crystals uric acid into test-tube. Add 8-10 drops of H_2O . Stir up. Add 3-4 drops of 10% $NaOH$ solution. Uric acid will be dissolved.

