ORGANIC CHEMISTRY

Experiment 1.
Detection of the hydroxyl group in ethanol (iodoform reaction)

Laboratory equipment:
- test tubes in rack,

Chemicals:
- ethanol,
- 2M NaOH,
- Lugol's solution (I_2 in KI)

Pour about 1cm^3 of ethanol into a test-tube, add the same volume of NaOH solution and Lugol's solution to obtain bright yellow colour of solution. Heat this mixture at 60 ^{0}C, since the bright yellow precipitate of iodoform appears. (The solution has characteristic smell of disinfectant).

$$2NaOH + I_2 \rightarrow NaIO + NaI + H_2O$$

$$CH_3CH_2OH + NaIO \rightarrow CH_3COH + NaI + H_2O$$

$$CH_3COH + 3NaIO \rightarrow I_3C - COH + 3NaOH$$

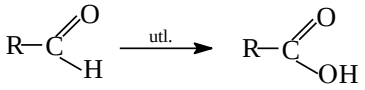
$$I_3C - COH + NaOH \rightarrow CHI_3 + HCOONa$$

Write down the reactions in the table of a report and the names of the products.

Experiment 2.
Determination of aldehyd group (Fehling's reaction)

Fehling reagent (mixture of I and II Fehling solutions) contains Cu^{2+} ions. It reacts with a aldehyde in redox reaction Cu^{2+} ions undergo reduction to Cu^+ and an aldehyde undergoes oxidation to an acid.

$$Cu^{2+} \xrightarrow{red.} Cu^+$$



Laboratory equipment:
- test tubes in rack,

Chemicals:
- aldehyde,
- Fehling's solution I ($CuSO_4$) solution,
- Fehling's solution II (alkaline solution of sodium potasium tartrate),

Mix the solution I and II in 1:1 ratio. Take 1cm^3 of this solution and add 1cm^3 of an aldehyde solution. Heat up slowly this mixture until boiling. It should appear brick-red precipitate of Cu_2O. Give the descripion of the experiment and write the equation of the reaction of aldehyde oxidation.

Experiment 3.
Tollens's reaction (Silver Mirror Test)

$$R\text{-}COH + 2Ag(NH_3)^+_2 + 3OH^- \rightarrow 2Ag + RCOO^- + 4\ NH_3 + 2H_2O$$

Laboratory equipment:
- test tubes in rack,
- beaker,

Chemicals:
- aldehyde (formaldehyde),
- 0.05M $AgNO_3$,
- 2M NH_4OH

Pour 1cm^3 $AgNO_3$ solution into a test-tube and then add as much of NH_4OH solution, as to dissolution of precipitate and then add 1cm^3 of aldehyde. Put the test-tube into a water bath. It should appear metallic silver on the walls of the test tube.Write down the reaction.

Experiment 4.
Detection of ketone group (Gunning's reaction)
This reaction is characteristic for methyloketone.

$$2NaOH + I_2 \rightarrow NaIO + NaI + H_2O$$

$$R - CO - CH_3 + 3NaIO \rightarrow R - CO - CI_3 + 3NaOH$$

$$R - CO - CI_3 + NaOH \rightarrow RCOONa + CHI_3$$

Laboratory equipment:
- test tubes in rack,

Chemicals:
- ketone (acetone),
- 2M NH_4OH
- Lugol's solution.

Add 0.5cm^3 of ketone solution to 1cm^3 of NH_4OH solution and then few droplets of Lugol's solution until yellow colour appears. Heat the mixture until 60^{0}C and leave it for few minutes. It should appear the yellow precipitate of iodoform with characteristic smell.
Write down the reation's details.

Experiment 5.
Detection of carboxyl group
Detection of COOH group is possible through its transformation to an ester in reaction with alcohol. The esters have characteristic smell of flowers or fruits.

$$R - COOH + HO - R' \xrightarrow{H_2SO_4} R - COOR' + H_2O$$

Laboratory equipment:
- test tubes in rack,

Chemicals:
- carboxyl acid,
- ethanol,
- H_2SO_4 concentrated.

Pour 1cm^3 of acid solution into the test-tube, add 1cm^3 of ethanol and few droplets of concentrated sulphuric acid. The mixture should has a characteristic smell of fruits.
Write down the esterification reaction.

Experiment 6.
The saponification reaction
The saponification raction is the reaction of long chain fatty acids, like Lauric C12, Myristic C14, Decanoic C10, Palmitic C16 and others and sodium hydroxide:

$$R\text{-}COOH + NaOH \rightarrow R\text{-}COONa + H_2O$$

Laboratory equipment:
- 1 test tube,
- water bath,
- gas burner,
- evaporating dish,
- watchglass,
- tripod,
- glass rod.

Chemicals:
- cocoanut oil,
- 12M NaOH

Put approximately 2 g (1 teaspoon)of coco nut oil into the evaporating dish. Pour 2 cm^{3}of 12M NaOH to the test tube and heat it in the water bath up to app. 60^{o}C. Place the evaporating dish with fat on the tripod and heat it until melting. Pour warm hydroxide to the oil and mix it with the glass rod until mixture thickens. Pour out the soap on the watchglass and observe.

20..../…. **WIMiR** **Gr.**	*Name, surname:* *Subject:* **ORGANIC CHEMISTRY**	*Assistant signature*

No	Experiment	Reactions	Observation, conclusions
1.	**Detection of hydroxyl group in ethanol (iodoform reaction)**		
2.	**Detection of aldehyde group (Fehling's reaction)**		
3.	**Tollens's reaction (Silver Mirror Test)**		
4.	**Detection of ketone group (Gunning's reaction)**		
5.	**Detection of carboxyl group**		
6.	**The saponification reaction**		