LABORATORY WORK NO. 25

HYDROCARBONS AND HALOGEN DERIVATIVES

- **PRINCIPLE:** Hydrocarbons are the simplest organic compound whose molecules are made up only from carbon and hydrogen. Hydrocarbons are divided according to various points of view:

  a) according to the types of bonds – saturated and unsaturated
  b) according to how the carbon skeleton is built – acyclic and cyclic

  The most significant acyclic (aliphatic) hydrocarbons are alkanes, alkenes and alkynes.

  Hydrogen derivatives arise when one or more atoms of hydrogen are replaced by another element or characteristic group. Halogen derivatives arise from hydrocarbons by replacing one or more atoms of hydrogen with elements such as F, Cl, Br, I.

TASK N. 1 PREPARATION OF METHAN FROM SODIUM ACETATE

- **CHEMICALS:** solid sodium acetate CH_3COONa, soda lime (mixture of NaOH and CaO in a ratio 3:1), 1% solution of $KMnO_4$

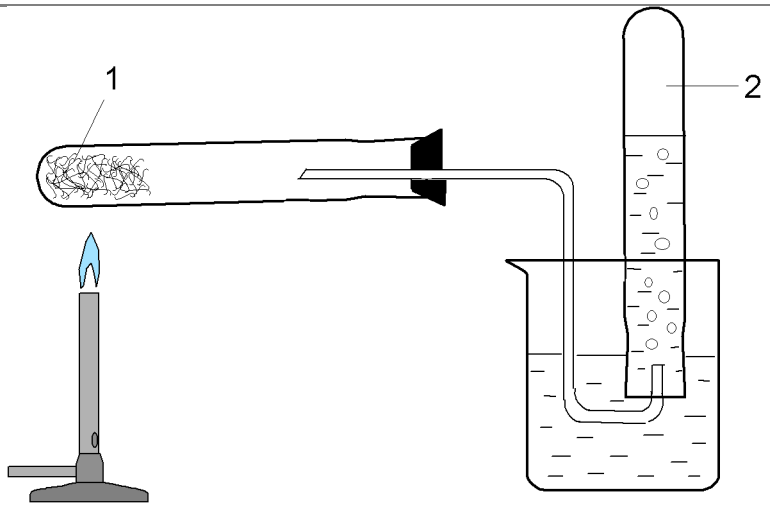
- **AIDS:** 2 test tubes, iron bowl, scales, tablespoon, glass bath , glass tube(s), rubber tube, burner, stand, mortar with a pestle, stick

- **PROCEDURE:** We dry out 3g of sodium acetate by constant stirring with the stick in the iron bowl. We triturate the remelted acetate with 3 g of soda lime in the mortar. We put the mixture into the test tube with a cork and a curved glass stick (tube). We heat the mixture until methan arises and we fill it into the test tubes which have been merged in the bath with water.

  Reaction equation:

  $$CH_3COONa + NaOH \rightarrow CH_4 + Na_2CO_3$$

  We collect the the arising methan into water with potassium manganate. We carry out a burning test.



where 1 – mixture of sodium acetate with soda lime, 2 – methane.

- **CONCLUSION:** Note down all the results of your observation.

TASK N. 2 PREPARATION OF ETHENE BY MEANS OF HETEROGENEOUS CATALYSIS

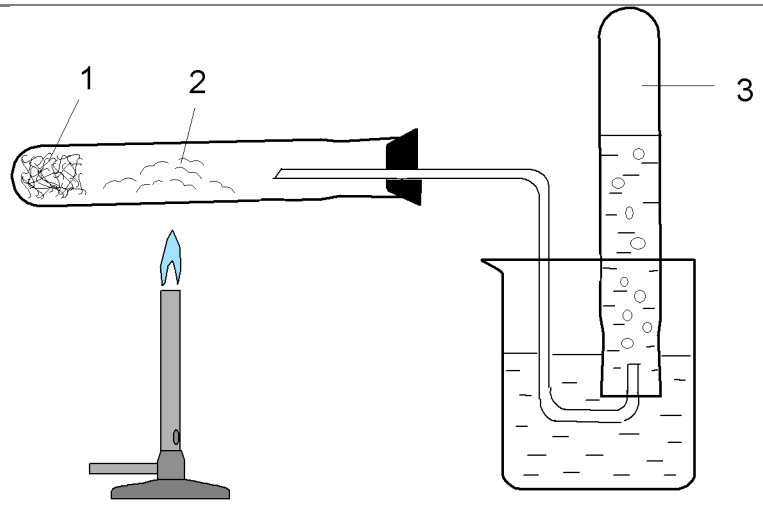
- **CHEMICALS:** ethanol, solid aluminium oxide Al_2O_3, $KMnO_4$ (c = 0,02 mol/l)

- **AIDS:** test tubes, tablespoon, glass bath , glass tube(s), rubber tubes, burner, test tube holder

- **PROCEDURE:** We put the apparatus together as shown in the picture. We put a 3 cm layer of the pasty mixture of aluminium oxide and ethanol into the test tube. We sprinkle 3 cm of dry powder of aluminium oxide on the surface of the pasty mixture. We close the test tube with a cork with a curved glass tube. Then we fasten the test tube into the stand and warm it up in the place where the aluminium oxide is present. Ethen arises and we fill it in the test tubes which are emerged in the water bath.
  Ethanol will dehydrate when Al_2O_3 catalyzer while ethen and water arise.

$$CH_3CH_2OH \rightarrow CH_2 = CH_2 + H_2O$$

We collect the arising ethen into water with potassium manganate. We carry out a burning test as well.



where 1 – aluminium oxide and ethanol, 2 – aluminium oxide, 3 – ethen.

- **CONCLUSION:** Write down the results of your observation.

TASK N. 3 PREPARATION OF IODOFORM FROM ETHANOL

- **CHEMICALS:** solid K_2CO_3, distilled water, ethanol, solid iodine
- **AIDS:** test tube, tablespoon, glass bath (trough), tubes, rubber tubes, burner, stand, test tube holder, Erlenmayer flask, water bath, scales, weighing boat (scoop), glass tube, thermometer, Büchner funnel, filter flask, filter paper, pipette
- **PROCEDURE:** We mix 5 g of potassium carbonate, 25 ml of water and 5 ml of ethanol in the Erlenmayer flask of 250 ml volume. We warm the reaction mixture up in the water bath up to 70-80°C and, while constantly stirring, we add gradually 2,5 g of iodine. When the brown colour disappears, we cool the flask with the mixture in it. We suck upthe yellow sediment and wash it with cold distilled water on the Büchner funnel. We dry the product in the air and weigh it.
- **CONCLUSION**: Write down how many grams of iodoform sprung from the reaction.
- **SAFETY:** Both iodoform and ethanol are strongly irritable substances. They irritate eyes and mucous membrane. Use protective clothing (glasses, gloves, coat) and do not breathe the fumes in.

STUDENT´S SHEET No. 25
HYDROCARBONS AND HALOGEN DERIVATIVES

1. Match the Czech names with their English equivalents

a) louh	1. sediment
b) nasycený roztok	2. soda lime
c) alifatické uhlovodíky	3. apparatus
d) deriváty	4. saturated solution
e) pevný	5. solid
f) sraženina	6. derivatives
g) přístroj	7. aliphatic hydrocarbons

2. Choose the correct word or spelling

1. a mixture of chemicals used in granular form in closed breathing environments is
   a) soda lime b) wine lime c) juice lime
2. a naturally occurring material that is broken down by processes of weathering and erosion is:
   a) sediment b) sedement c) sedament
3. one of the four fundamental states of matter (the others being liquid, gas, and plasma) is
   a) liquid b) gas c) solid
4. In what can carbon atoms be joined together in straight chains, branched chains, or non-aromatic rings?
   a) aliphatic hydrocarbons b) alliphatic hydrocarbons c) aromatic carbons

3. Fill in the missing letters

a) To i-r-tat-
b) E-uat-o-
c) S-di-m a–eta-e
d) –at-l-z-r
e) Sa-u-a-ed s-l-ti-n

4. Complete the crossword. Find the following words: sediment, aluminium oxide, ethane, methane, aliphatic, bond

O	T	J	B	W	R	U	R	G	U	J	P	O
T	A	S	B	A	G	M	G	A	P	I	O	L
B	L	R	E	T	T	E	A					
R	U	L	A	C	X	L	L	U	L	N	K	I
X	M	P	K	S	E	D	I	M	E	N	T	J
E	I	H	E	G	S	P	P	O	R	T	A	**R**
Q	N	U	R	M	E	O	H	I	J		T	H
Y	I	R	I	E	T	H	A	N	E	P	V	G
H	U	I	U	T	H	J	T	C	M	I	D	F
N	M	H	Z	H	I	H	I	E	T	P	G	D
I	O	O	F	A	P	B	C	R	N	E	R	S
K	X	L	G	N	L	D	E	L	R	T	N	A
O	I	D	H	E	O	E	D	T	F	T	F	Y
L	D	E	T	E	S	T	T	U	B	E	D	Q
P	E	R	E	M	J	T	X	E	E	U	E	W
Z	W	A	T	E	R	B	O	N	D	U	G	E

5. Match the English names with their Czech equivalents

a) solid	1. octan sodný
b) to irritate	2. nasycený roztok
c) catalyzer	3. pevný
d) ratio	4. dráždit
e) equation	5. katalyzátor
f) sodium acetate	6. poměr
g) saturated solution	7. rovnice

6. Find the right word

a) qoneuati	equation
b) manethe	methane
c) ailphiatc	aliphatic
d) hdyorcraobn	hydrocarbon
e) dreiavtiev	derivative