LABORATORY WORK NO. 34

MICROSCOPY

PRINCIPLE: So called microcrystaloscopy is used in chemical laboratories for some identifications. It uses an optical microscope when proving substances on the base of their crystal structure.

Description of an optical microscope

An optical microscope composes of mechanical, optical and illuminating parts.

Mechanical parts:

Stand – is a heavy support with adequate stability. One of its parts is the arm to which the tube is connected.

Tube – connects the objective lenses at the lower end and the eyepiece at the upper end.

Stage of microscope – is a flat platform with stage clips that hold the slide in the place, with a hole in the middle for the which enables light to pass through.

Focus knob – for moving the tube (to get closer or further from the preparation (specimen).

Optical parts:

Objective – is a set of lenses built into a metal socket with threading to enable it to be screwed into the tube. Magnifying data, focal distances and other data are stated on the metal cover.

Eyepiece lens – is a metal socket with lenses on both ends. The lower lens is the so called collection lens and the upper lens is the eyepiece lens. There is a circle stop between the lenses defining the picture. At the top part of the socket, there is magnifying data engraved.

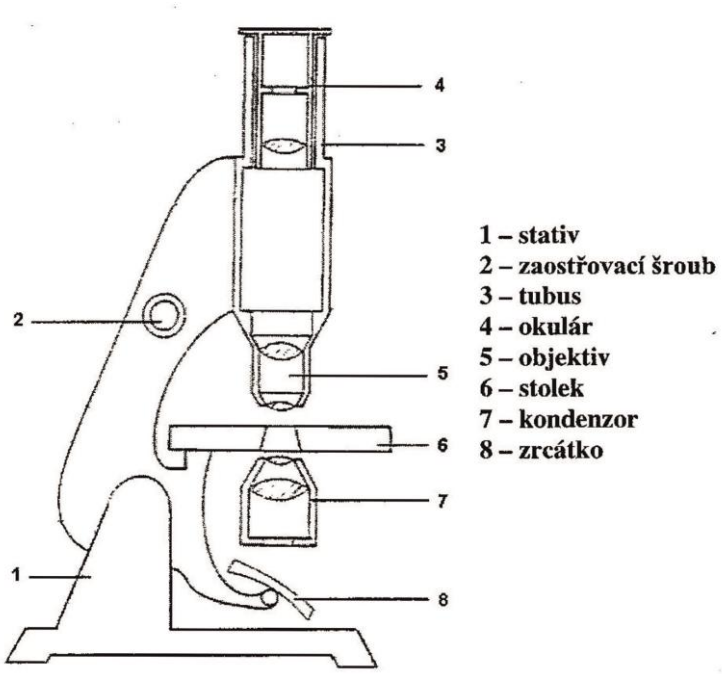
Illuminating parts:

Illuminating parts are a mirror and a condenser lens. The light beams from different sources are reflected back by the mirror into the condenser lens, which focuses the light onto the specimen. There is an iris diaphragm which regulates the illumination of the field of view.

Handling the microscope

The basic handling rules can be summed up into the following points:

1) ***Adjusting the microscope*** - microscope must be adjusted on the desk so that it is possible for a person handling it to sit straight but comfortably while working.
2) ***Illuminating of the field of view*** - move the mirror while looking into the microscope to be able to set optimal light for observation. While moving the mirror, be cautious not to shield the light with your fingers or palm.
3) ***Drawing the objective away from the desk*** - make a sufficient space to enable inserting of the specimen.
4) ***Placing the specimen*** - the object you want to observe should be placed against the middle of the objective. Hold the specimen with one clip only.
5) ***Lower the tube*** - lower the tube as close to the observed object until the lens nearly touches it. Watch it from outside.
6) ***Zooming in*** - when looking in to the eyepiece, zoom in until the specimen is sharp. If you are not successful, do the last 2 actions as written above.
7) ***Find the most demonstrative place*** for the observation and fasten the specimen with the second clip.



Picture: a microscope drawing.

Translation of the Czech words in the picture:

1. Stand
2. Focus knob
3. Tube
4. Eyepiece lens
5. Objective lens
6. Stage of microscope
7. Condenser lens
8. Mirror

TASK N. 1 INORGANIC MICROCRYSTALOSCOPY

- **CHEMICALS:** 1% solution of $AgNO_3$, solution of H_2SO_4 (c= 1mol/l), 1% solution of $CaCl_2$, Cu - chip, concentrated HNO_3, crystals of $K_2Cr_2O_7$, distilled water
- **AIDS:** microscope, pipette, slide, glass fiber

A) PROOF OF SILVER PRESENCE IN A COMPOUND

- **PROCEDURE**: We apply with a pipette a drop of 1 % solution of AgNO3 on a slide. We transfer (by a glass fiber wetted in distilled water) a copper chip on the edge of the drop. We place the specimen under the microscope and zoom in the copper chip. We can observe the tree growing of crystallic formations of elementary silver.

B) CALCIUM AS CALCIUM SULPHATE

- **PROCEDURE**: We drop a 1 % solution of CaCl2 on the slide and we add 1 drop of diluted sulphuric acid. After a while, typical colourless formations of gypsum crystals will start growing. The visibility is better with higher stop.

C) SILVER AS SILVER DICHROMATE

- **PROCEDURE**: We drop with a capillary pipette a 1 % solution of $AgNO_3$ on a slide. Next to it, we drop a drop of concentrated HNO_3. We join and mix both drops using a glass fiber. We carefully add (using another glass fiber) a crystal of potassium dichromate. We put the specimen under the objective and we observe. The potassium dichromate will slowly dissolve and red crystals of silver dichromate will arise.
- **CONCLUSION:** Draw separate conclusions to each of the tasks. Write the reaction equation, the magnifying used for crystal observation and a sketch of the crystals (A5).
- **SAFETY:** Potassium dichromate is toxic if consumed and in contact with skin. The concentrated nitric acid etches the skin and if breathed in, it causes burning of mucous membrane. Follow all safety precautions and use protective gear.

TASK N. 2 ORGANIC MICROCRYSTALOSCOPY

- **CHEMICALS:** diluted solution of ethanol, 5 % solution of NaOH, Lugol solution, ethanol solution of acetic acid, ethanol solution of $AgNO_3$, 1% solution of lactic acid, solid $ZnCO_3$, distilled water

- **AIDS:** microscope, capillary pipette, slide, burner, pliers

A) IODOFORM TEST

- **PROCEDURE:** We drop a drop of diluted solution of ethanol on a slide. We add a drop of 1 % Na OH and a drop of Lugol solution. If no sediment appears, we warm up the slide slowly. We wash the sediment a few times with distilled water, adding always a drop of distilled water and mixing it - we drain a part of distilled water using filtration paper. After a while, we will observe bright yellow formations of iodoform.

B) Silver salts of monocarboxylic acid

- **PROCEDURE**: We drop a drop of ethanol solution of acidic acid on a slide. We add a drop of ethanol solution of silver nitrate. Bony formations of acetic acid salts appear.

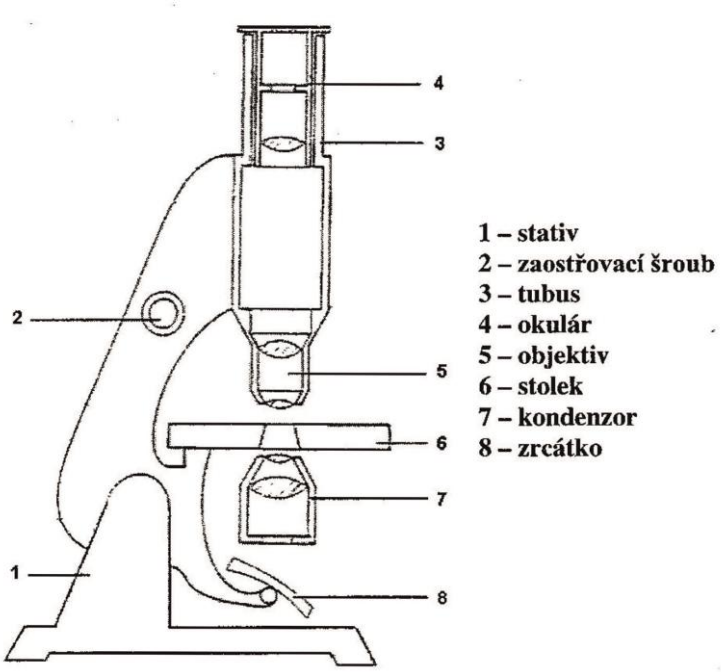
C) Lactic acid as zinc lactate

- **PROCEDURE**: We drop a drop of the 1% solution of lactic acid. We add (using a glass fiber) some tiny crystals of zinc carbonate. We mix it and leave to react for 15 minutes. Colourless hedgehog clusters of crystals of zinc lactate trihydrate appear.

- **CONCLUSION:** Draw separate conclusions to each of the tasks. Write the reaction equation, the magnifying used for crystal observation and a sketch of the crystals (A5).

STUDENT´S SHEET No. 34
MICROSCOPY

1. **Describe the picture of the microscope:**



2. **Match the English words to the Czech translations:**

Base	objímka
Socket	čočka
Tube	pronikat (o světle)
Eyepiece	stativ
Stage	zvětšit
Illumination	rameno
Arm	okulár
To pass through	objímka
To magnify	tubus
Lens	osvětlení

3. **Find the correct word for the sentence:**

1) A ----- connects the objective lenses at the lower end the eyepiece at the upper end.

a) tubus b) tube c) tuba

2) An ---- is a set of lenses built into the metal socket with threading to enable it to be screwed into the tube.¨

a) objectiv b) objektive c) objektive

3) The --- parts are a mirror and a condenser lens.

a) iluminating b) illuminating c)ilumminating

4) When looking in to the eyepiece, zoom in until the --- is sharp.

a) speziment b) speciman c) specimen

5) We carefully add (using another glass fiber) a crystal of --- dichromate.

a) potassium b) pokassium c) potassiem

4. Find the following words in the crossword and explain them in English:

tube, base, stage, potassium, zinc lactate, sediment, objective, dichromate

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

5. Fill in the missing letters:

a)	L-NS	ČOČKA
b)	CR-STAL-OI-	KRYSTALICKÝ
c)	SP-C-ME-	VZOREK
d)	E-E-IE-E	OKULÁR
e)	CON-E-SE- L-NS	KONDENZAČNÍ ČOČKA

6. Find the right word from the definitions:

a) A flat platform with stage clips that hold the slide in the place

stage sage focus knob

b) A metal socket with lenses on both ends.

focus knob eyepiece condenser lens

c) A set of lenses built into the metal socket with threading to enable it to be screwed into the tube.

condenser lens objective mirror

d) A device used for moving the objektive

focus know condenser lens eyepiece