

**Scenario of the lesson on:
Optical microscope since the first until modern ones.**

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62 – 800 Kalisz

The general aim: knowing history and how an optical microscope works.

Detailed aims (a student):

- can:
 - name two first famous constructors of microscope,
 - say, what was discovered by using first microscopes,
 - discuss a construction of microscope,
 - calculate a microscope's magnification.

Methods

- *searching*: conversation with students (asking questions);
- *practical*: complementing „a work's card”, making calculation of microscope's magnification, seeing samples with microscope.

Work forms

- collective,
- individual.

Didactic measures

- a PPT's presentation – „A microscope”, a computer, a multimedia projector,
- a blackboard, chalk,
- “work's cards”,
- sheets with homework.

The lesson's scenario

TEACHER'S ACTIVITIES	STUDENTS' ACTIVITIES
1. Start.	
- Welcome and presence checking.	- They are sitting down.
- Giving work's cards to students. Telling students that completing work card is obligatory during watching the presentation.	
2. The amplification of lesson.	
- Showing the presentation – „A microscope”. The presentation contains: history and the way that microscopes work. There are information about first microscopes built by Jannsens, Leeuwenhoek, Hooke and modern microscopes. There are also: schemes of Hooke's and modern microscope (You can tell how the microscope works using school's one), scheme that helps understanding an image's	<ul style="list-style-type: none"> - They are completing work cards. - They are completing a scheme of microscope with names of components of the Hooke's microscope.

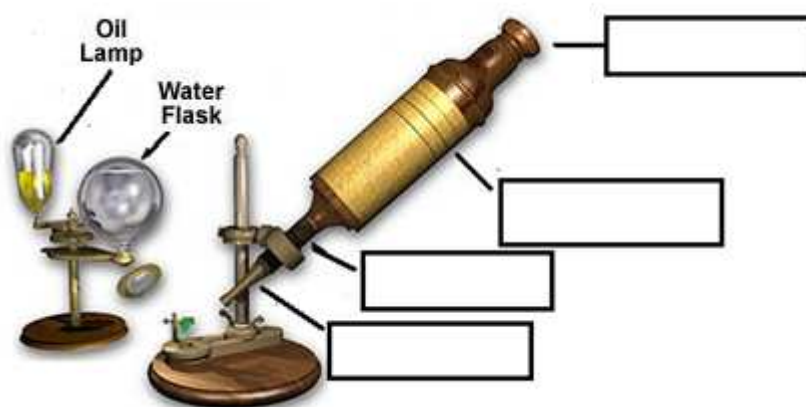
obtaining, the formula for microscope's magnification.	
- Discussing right answers (first part from work's cards).	- They are checking if their answers are right or not. If answer is wrong, they correct.
- Going over right answers – names of elements of the Hooke's microscope's construction.	- They are checking if names of components Hooke's microscope are right or not. If name is wrong, they correct.
- Discussing the formula of a microscope's magnification.	- They are checking the formula of a microscope's magnification, if they wrote it right or wrong. They're correct, if formula is wrong.
- Asking student for reading the fourth (IV.) exercise's instruction.	- They're reading. (One of them is reading an instruction out.)
- Helping students in analyzing the exercise.	- They're analyzing an exercise. They're reading and writing on a blackboard: data, an unknown quantity and formula. (It can be made by one student or by a group of students.)
- Monitoring students' work.	<p>- One of students is working the exercise out on the blackboard and the rest is making it on the work's cards.</p> <p>Data: Unkown: Formula:</p> <p>$f_{ok} = 5 \text{ cm}$ $m = ?$ $m = \frac{s}{f_{ok}} \cdot \frac{25 \text{ cm}}{f_{ob}}$</p> <p>$f_{ob} = 1 \text{ cm}$</p> <p>$s = 10 \text{ cm}$</p> <p>$M = \frac{10 \text{ cm}}{5 \text{ cm}} \cdot \frac{25 \text{ cm}}{1 \text{ cm}} = 2 \cdot 25 = 50$</p> <p>Answer: The microscope's magnification is equal 50.</p>
- If lesson is finished before the time, teacher can give students a school's microscope(s) to see same samples by using different objectives that give different magnification.	- They are watching different samples by using microscopes with different objectives.
3. Finish.	
- Reassuming students' work, giving a note for theirs activity during the lesson. Giving sheets with homework. Bidding students goodbye.	- Bidding the teacher goodbye.

The worksheet

I. Complete sentences during watching the presentation.

- 1) Magnifiers and "burning glasses" were mentioned in the writings of _____ and _____.
- 2) Leeuwenhoek built a microscope which magnification was equal _____, therefore it was built with _____ lens/lenses.
- 3) Antonie van Leeuwenhoek was the first who saw and described _____, _____, _____ and _____.
- 4) Robert Hooke constructed his first microscope about _____ a.d. He built the microscope which had _____ lenses.

II. Name the marked elements on the Hooke's microscope's scheme .



III. Rewrite from the one of the presentation's slide the magnification formula.

s – the length of microscope tube

f_{ob} – focal length of _____

f_{ok} – focal length of _____

- IV. The focal length of objective of a microscope is equal 1 cm and focal length of eyepiece 5 cm. How big is the microscope's magnification, if the length of tube's microscope is equal 10 cm?

Homework

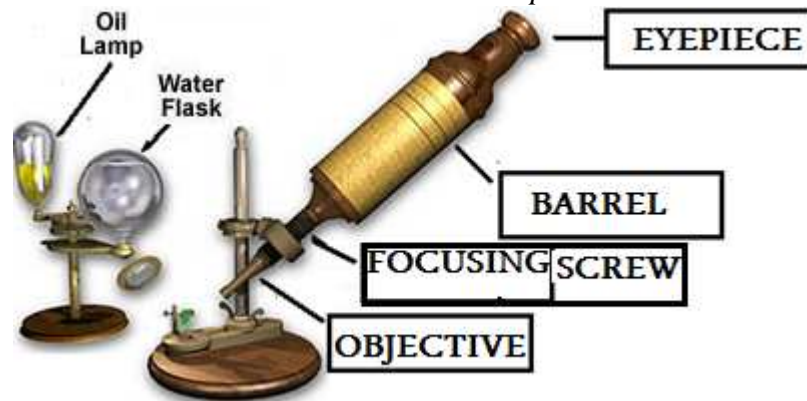
- 1) A microscope's objective has focal length equal 4 cm, its eyepiece's focal length is 8 cm and length of its tube is 13 cm. How big is the microscope's magnification?
- 2) Using internet find answers for questions:
 - a) What is the biggest magnification of modern optical microscopes?
 - b) Is it possible watching cell or its elements by using the modern optical microscopes? (What elements?)
 - c) What is the price of that kind of microscope?

Predicted right answers in the worksheet

I. Complete sentences during watching the presentation.

- 1) Magnifiers and "burning glasses" were mentioned in the writings of Seneka and Pliny the Elder.
- 2) Leeuwenhoek built a microscope which magnification was equal 270, therefore it was built with one lens/lenses.
- 3) Antonie van Leeuwenhoek was the first who saw and described bacteriae, the existence of tiny living organisms in a drop of water, the circulation of blood corpuscles in capillaries, yeast.
- 4) Robert Hooke constructed his first microscope about 1660 a.d. He built the microscope which had three lenses.

II. Name the marked elements on the Hooke's microscope's scheme.



III. Rewrite from the one of the presentation's slide the magnification formula.

$$m = \frac{s}{f_{ok}} \cdot \frac{25 \text{ cm}}{f_{ob}}$$

s – the length of microscope tube

f_{ob} – focal length of objective

f_{ok} – focal length of eyepiece

IV. The focal length of objective of a microscope is equal 1 cm and focal length of eyepiece 5 cm. How big is the microscope's magnification, if the length of tube's microscope is equal 10 cm?

Data:

$$f_{ok} = 5 \text{ cm}$$

Unkown:

$$m = ?$$

Formula:

I

$$f_{ob} = 1 \text{ cm}, s = 10 \text{ cm}$$

$$M = \frac{10 \text{ cm}}{5 \text{ cm}} \cdot \frac{25 \text{ cm}}{1 \text{ cm}} = 2 \cdot 25 = 50$$

Answer: The microscope's magnification is equal 50.