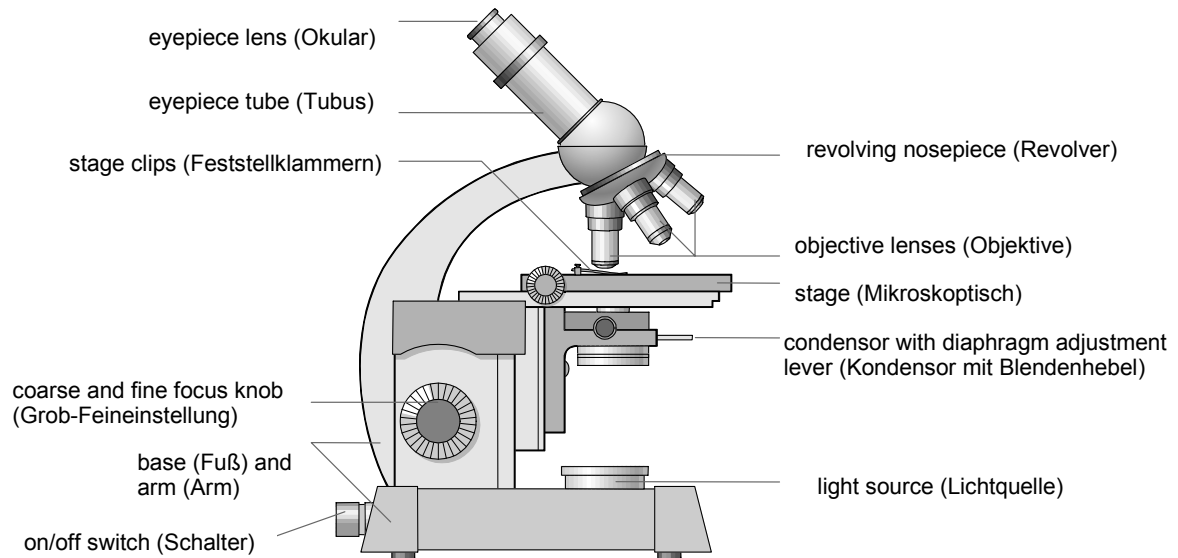


Working with the Light Microscope

Lösungen

The parts of the light microscope and their functions

Task 2: Label the diagram of the light microscope. Add the German terms in brackets.



Task 3: Determine the magnifying powers of your microscope.

To determine the magnification used you multiply the power of the eyepiece lens by the power of the objective lens. (10 x 4 : 40 x / 10 x 10: 100 x / 10 x 40: 400 x)

Instructions to use the microscope

Task 1: Use the following expressions to complete the text.

1. Carry the microscope **with both hands**, one on the arm and the other under the base of the microscope.
2. Make sure the brightness control is at the **lowest** setting.
3. Check that the lowest power **objective** is in position. Always start with this magnification.
4. Place the slide with specimen and cover slip on the stage and **centre** the specimen over the hole in the stage.
5. Turn on the light and adjust the light so that it is **comfortable** for your eyes.
6. While **watching from the side**, raise the stage until it comes to a stop or until the objective lens and the cover slip are close but not **touching**.
7. Use the coarse and fine focus knobs to **focus** the specimen by moving the stage in the opposite direction, i.e. **away from** the objective lens.
8. Finally, you can adjust **the contrast** using the diaphragm adjustment lever.
9. To change the magnification, lower the stage, turn the **revolving nosepiece** to the next objective. Looking at the microscope from the side push up the stage as in 6 and continue as above.

Before returning the microscope to the cabinet check that...:

10. ...your **slide is removed** and that the lowest-power objective is in place.
11. ... the brightness control is turned to the lowest setting and the power switch turned off.
12. ... the power cord is **neatly wrapped around** the microscope.

Preparing a slide

Task: Describe how a slide is prepared by completing the speech bubbles.

1. Using a dropper place a drop of water on a clean slide.
2. Use tweezers to place the specimen into the drop of water. The specimen must be small (smaller than the cover slip!) and very thin.
3. Place a cover slip at a 45-degree angle with one edge touching the water drop. Support it with a mounted needle and lower it gently. This will prevent the formation of air bubbles.
4. There should always be a thin film of water between the slide and the cover slip. The rest of the slide, however, should be dry. So make sure you suck up any excess water around the cover slip with a paper towel.
5. To stain a specimen place one drop of staining solution on the edge of the cover slip and the flat end of a piece of paper towel on the other edge of the cover slip. The paper towel will draw the staining solution under the cover slip.

Examination of a pondweed leaf

Task 1: Determine the diameter of the circle of light at 40x and 100x magnification.

The field of view when using the 10x objective (100x total magnification) is 2 mm. If 8 plant cells extend across the field of view (2 mm), then each cell is $\frac{2}{8}$ or 0.25 mm long.

Objective	Magnification (10 x Ocular)	Diameter of field of view
4x	40x	4.0 mm oder 4000 μm
10x	100x	2.0 mm oder 2000 μm
40x	400x	0.4 mm oder 400 μm

Task 2: Prepare a wet mount of the tip of one Elodea leaf.

Size of pondweed cells and chloroplasts:

At medium magnification about 30 Elodea cells fit into the distance across the circle of light. An Elodea cell is about 50 μm long.

About 10 chloroplasts fit into one length of an Elodea cell. A chloroplast is about 5 μm long and 2 μm thick.

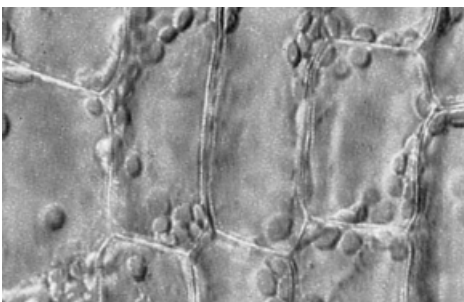
Task 3: How many rooms does a pondweed cell have.

- A pondweed cell has two rooms.
- The chloroplasts seem to move along the cell wall. This movement is the result of the streaming movement of the cytoplasm. The chloroplasts are carried along by the cytoplasm. The cytoplasm occupies only a small space between the cell wall and a large central room called vacuole.

Task 4: Make the nucleus visible.

The nucleus becomes visible when we stain the cell with methylen blue. It is located in the cytoplasm and also carried along with its streaming movement.

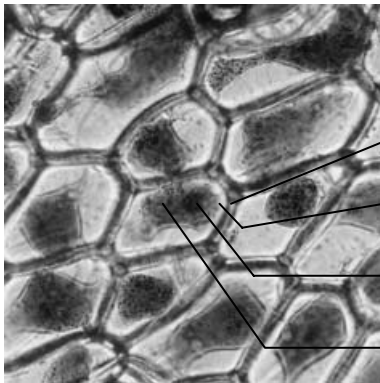
Anfärbung mit Methylenblau



Task 5: Make the cell membrane visible.

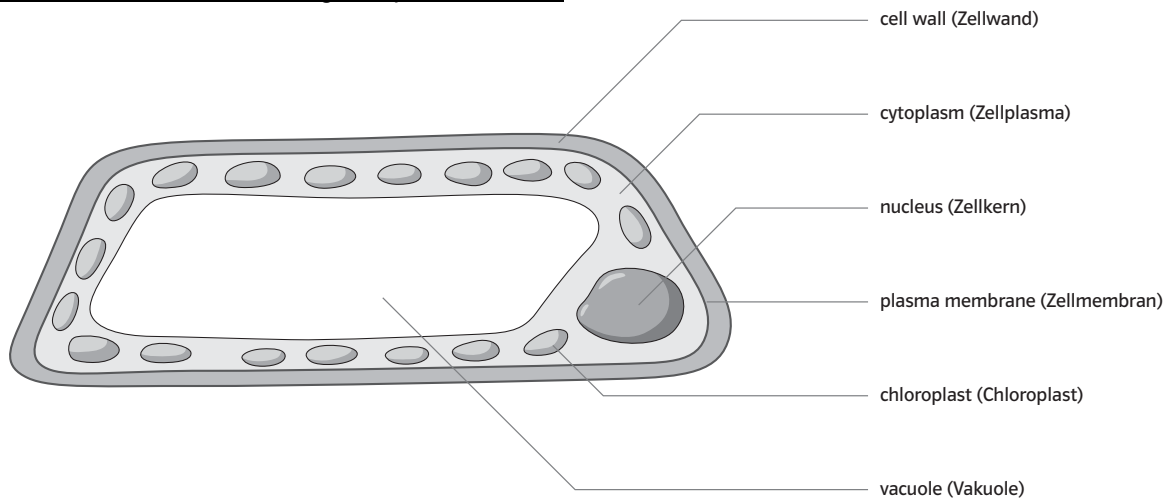
- The plasma membrane becomes visible when we expose pondweed cells to salt/saline solution.
- When plant cells are surrounded by salt water, the water inside the plant moves from where there is more water (less salt) through the cell wall and cell membrane to the outside where there is less water (more salt). The vacuole shrinks and pulls the cytoplasm away from the cell wall. The cell membrane becomes visible.
- Salt solution moves into the cells and fills the space between cell wall and cell membrane.
- The cell wall is permeable for water and larger molecules. The cell membrane is permeable for water but not for larger molecules, it is selectively permeable.
- The process of water movement from a high concentration of water to a lower concentration of water through a selectively permeable membrane is called osmosis.

Plasmolyse nach Durchziehen einer 10% Kochsalzlösung



- cell wall
- plasma membrane
- nucleus
- cytoplasm with chloroplasts around shrunken vacuole

Task 6: Make a labelled drawing of a pondweed cell



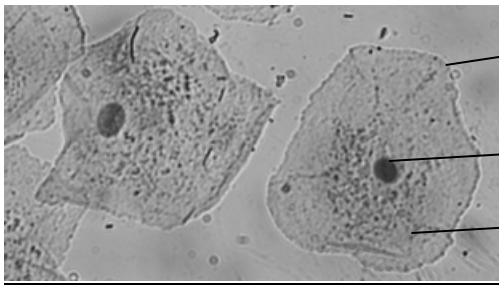
Anmerkungen:

Deutlich sichtbar sind für die Schüler/innen zunächst nur die Zellwände und die Chloroplasten, die mit der Plasmaströmung in einem schmalen Raum an der Zellwand entlang transportiert werden. Daraus kann die Aufteilung des Zellinnenraums in den schmalen Zellplasmaaum und die große zentrale Vakuole erschlossen werden.

Die transparente Zellmembran und der transparente Zellkern sind in der Regel nicht auszumachen. Der Zellkern kann über Anfärbung mit Methylenblau, die Existenz der Zellmembran durch einen Plasmolyseversuch sichtbar gemacht werden.

Die Anfärbung mit Methylenblau erfolgt durch Einlegen des Objekts in einen Tropfen Methylenblau und wird am besten durch einen Demonstrationsversuch über das mit dem Monitor/ Beamer verbundene Lehrermikroskop vorgestellt. Hier wird deutlich, dass der Zellkern sich auch im Zellplasma befindet, da er – wenn auch langsam – mit der Plasmaströmung mitgeführt wird. Der Plasmolyseversuch kann auch so vorgestellt – oder bei genügend Zeit – von den Schülern oder Schülerinnen selbst durchgeführt werden.

Examination of human cheek cells



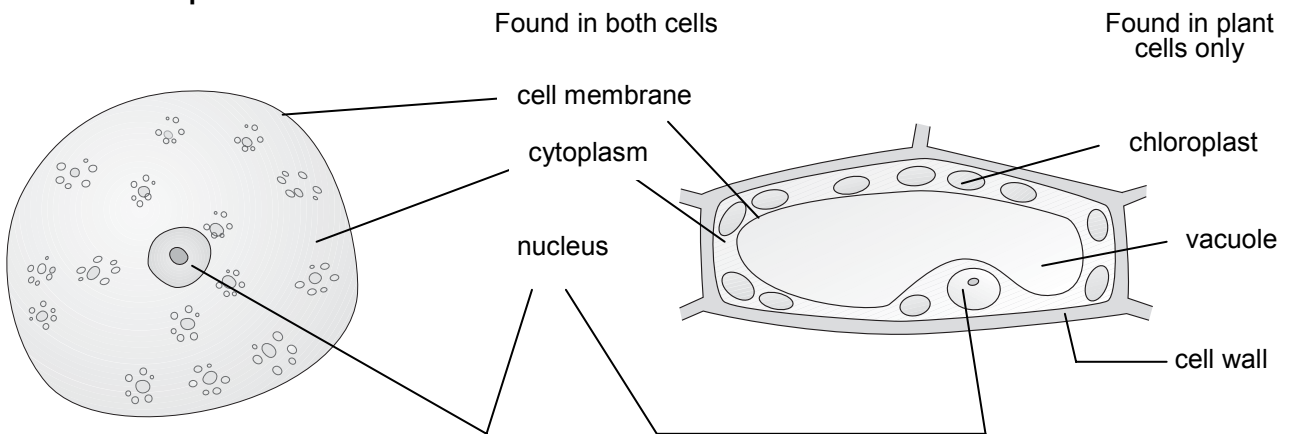
cell membrane

nucleus

cytoplasm

Average cell size: 60µm, nucleus: 5µm

Animal versus plant cell



Cell Structures	Funktionen
cell membrane	surrounds the cytoplasm, forms a boundary / barrier which regulates what enters and exits the cell
nucleus	contains the cell's genetic material, controls the activities of the cell
cytoplasm	is the site where most cellular activities occur/take place
cell wall	stabilizes the cell, gives the cell its shape
chloroplast	makes photosynthesis, produces glucose and oxygen
vacuole	is filled with cell sap, helps to keep the cell swollen with water and thus keeps the plant tissue firm