

Working with the Light Microscope

Study goals and vocabulary

You should be able to ...

- label a diagram of a light microscope
- name the tools and equipment necessary to examine a specimen with the light microscope
- explain how an object can be focused without damaging the objective lens
- describe how you find out the magnifications you can get with a given microscope
- make labelled sketches of an animal and a plant cell and describe the functions of the cell structures
- describe how you can make the nucleus and the cell membrane visible

Vocabulary

light microscope eyepiece lens (body) tube revolving nosepiece objective lens(es) stage stage clips coarse/fine focus knob to focus condenser diaphragm diaphragm adjustment lever base with light source arm	Lichtmikroskop Okular Tubus Revolver Objektiv(e) Objekttisch Feststellklammern Grobtrieb / Feintrieb scharfstellen Kondensor Blende Blendenhebel Fuß mit Lichtquelle Griff
slide cover slip to lower the cover slip dropper/pipette/pipet mounted needle tweezers staining solution methylene blue salt/saline solution paper towel specimen/object	Objekträger Deckgläschen das Deckgläschen absenken Pipette Präpariernadel Pinzette Färbelösung Methylenblau Salzlösung Papierhandtuch Präparat/Objekt
to examine under the light microscope to get a magnified image to magnify magnification low/medium/high power	mit dem Lichtmikroskop, (LM) betrachten eine vergrößertes Bild bekommen vergrößern Vergrößerung niedrige/mittlere/ starke Vergrößerung
cell structures plasma membrane / cell membrane cytoplasm nucleus (nuclei) chloroplast vacuole cell sap cell wall boundary to stabilize photosynthesis glucose oxygen carbon dioxide osmosis to shrink, shrank, shrunk (selectively) permeable	Zellstrukturen Zellmembran Zellplasma Zellkern (Zellkerne) Chloroplast Vakuole Zellsaft Zellwand Grenze stabilisieren Fotosynthese Glukose, Traubenzucker Sauerstoff Kohlenstoffdioxid Osmose zusammenschrumpfen (selektiv) durchlässig

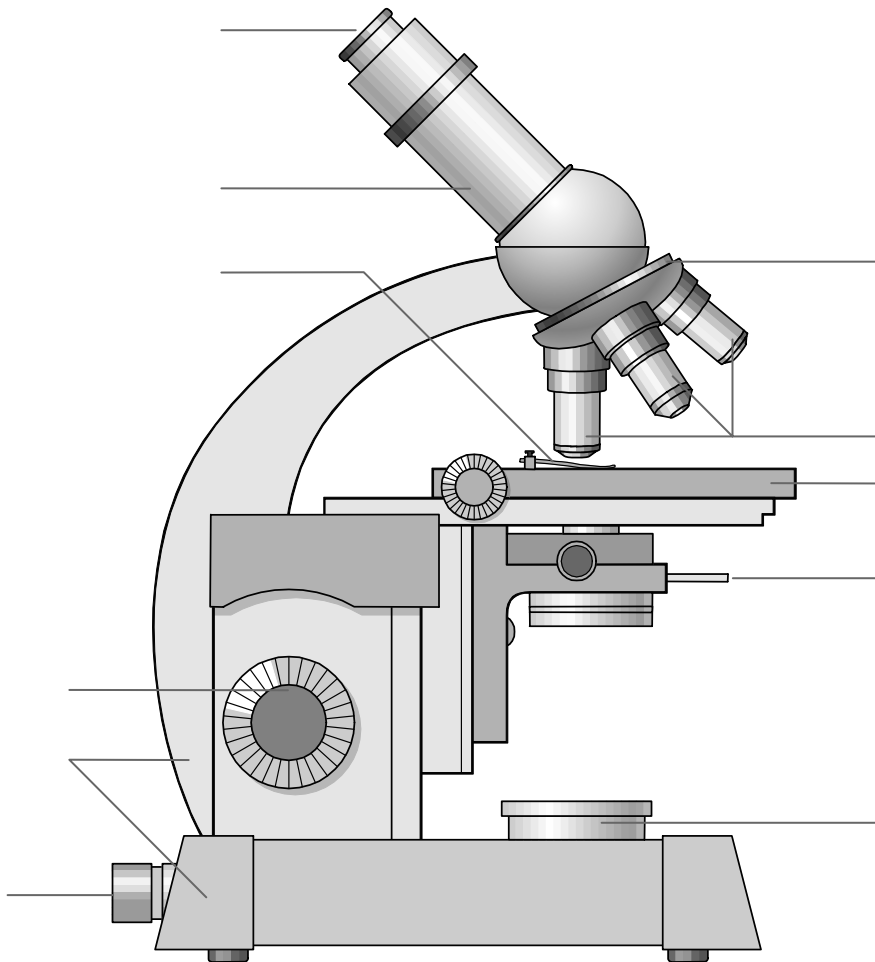
Working with the Light Microscope

The parts of the light microscope and their functions

Task 1: Identify the following parts of the light microscope

- base and arm - support the light microscope
- on/off switch - provides power
- stage - holds the slide with the object
- stage clips - hold the slide
- coarse and fine focus knob - move the stage up/down to focus the object
- eyepiece lens / ocular - the lens you look through
- eyepiece tube - holds the eyepiece lens
- revolving nosepiece - holds the objective lenses
- objective lenses - magnify the specimen
- condenser with diaphragm adjustment lever - regulates amount of light passed through object
- light source - provides light

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



Task 3: Determine the magnifying powers of your microscope.

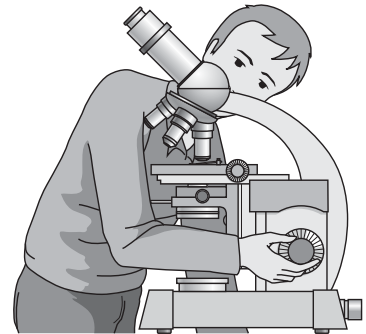
Working with the Light Microscope

Instructions to use the microscope

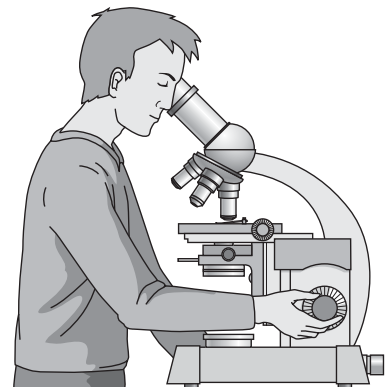
Task: Use the following expressions to complete the text.

touching - the contrast - centre - neatly wrapped around - (to)focus - comfortable - slide is removed - with both hands – watching from the side - lowest - revolving nosepiece - away from - objective

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



Putting the objective lens in place. Stage is moved towards objective lens.



Focusing. Stage is moved away from objective lens.

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

10. ...yourand 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 isthe microscope.

Working with the Light Microscope

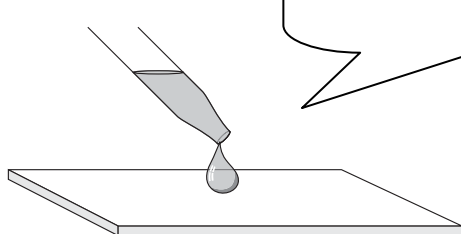
Preparing a slide

One of the most important steps of working with a microscope is preparing a slide. The microscope slide holds the specimen you will be examining through the microscope. In order to see your specimen clearly, you must prepare a microscope slide properly.

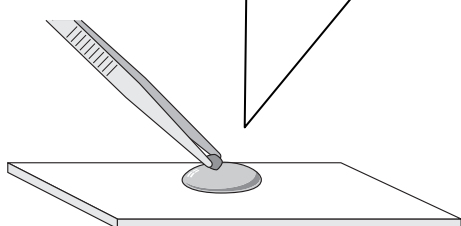
Task: Describe how a slide is prepared by completing the speech bubbles.

Vocabulary:

air bubble	Luftbläschen
cover slip	Deckgläschen
dropper/pipette	Pipette
excess water	überschüssiges Wasser
tweezers	Pinzette
to lower	absenken
mounted needle	Präpariernadel
paper towel	Papierhandtuch
scalpel	Skalpell
slide	Objektträger
specimen	Objekt
staining solution	Färbelösung

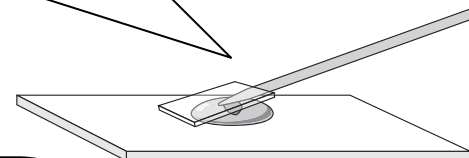


1. Using a place a drop of water on a clean

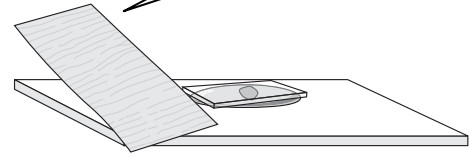


2. Use to place into the drop of water.


The specimen must be small (smaller than the cover slip!) and very thin.



3. Place a at a 45-degree angle with one edge touching the water drop. Support it with a and it gently. This will prevent the formation of



4. There should always be a thin film of water between the and the cover slip. The rest of the slide, however, should be dry. So make sure you suck up any around the cover slip with a



5. To stain a specimen place one drop of on the edge of the and the flat end of a piece of on the other edge of the cover slip. The paper towel will draw the under the cover slip.

Working with the Light Microscope

Examination of a pondweed leaf (Elodea leaf)

When you look into a light microscope you will see a circle of light. Measuring the diameter will help you to get a rough idea of the size of cells and cell structures you will examine.

Materials:

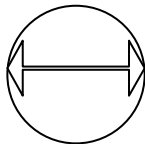
- pondweed (Elodea)
- light microscope, slides and cover slips, droppers
- tap water, iodine solution and 10% salt solution
- transparent millimetre paper
- paper towel

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

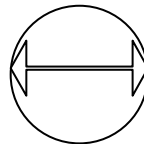
- Put the transparent millimetre paper on the stage and focus the scale at 40x magnification and 100x magnification.
- Determine the distance across the circle of light you get with the lowest (40x) and the medium (100x) magnification of your microscope.
- State the distances in millimetres (mm) and in micrometres (μm).
- Estimate the length of one all.

1cm	= 10 mm
1 mm	= 1000 μm

magnification: 4x



magnification: 10x



Objective	Magnification (10 x Ocular)	Diameter of field of view

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

- Put a drop of water on a clean slide.
- Add the tip of a pondweed leaf.
- Place a cover slip over the specimen.
- Follow the instructions on how to focus the object.
- Observe the leaf under low, medium and high power.
- State the number of layers a pondweed leaf consists of.
- State the size of a pondweed cell.
- State the size of a chloroplast.

Elodea or pondweed is an aquatic plant. It lives entirely under water except for its small white flowers. It spreads fast by leafy stalks that fall off from the plant, float away and root somewhere else. This characteristic has given the plant its English and German names.
weed = Unkraut
pondweed = Wasserpest

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

- Look for moving chloroplasts in the cells.
- State where in the cells the chloroplasts are located.

Vocabulary:

cell wall	Zellwand
plasma membrane	Zellmembran
chloroplast	Chloroplast
cytoplasm	Zellplasma
nucleus/nuclei	Zellkern(e)
vacuole	Vakuole
methylene blue	Methylenblau
to stain	anfärben
staining solution	Färbelösung
salt /saline solution	Salzlösung

Task 4: Make the nucleus visible.

- Prepare a new wet mount.
- This time put a drop of methylene blue on a clean slide. (Careful: Methylene blue stains the desk, your skin and clothes as well!)
- Add the tip of a pondweed leaf.
- Place a cover slip over the specimen.
- Follow the instructions on how to focus the object.
- Observe the leaf under low, medium and high power.
- State where the nucleus is located.

Task 5: Make the cell membrane visible.

- Prepare a new microscopic slide with the tip of an Elodea leaf.
- This time pull a 10% salt solution through the specimen.
- Make sure that there is no salt solution on the cover slip or around it. The objective lens may be destroyed on contact with salt solution.
- Watch the cells directly after this procedure at medium magnification.
- Describe your observation.
- Explain your observation. What does it tell about the characteristics of the cell wall and the cell membrane?

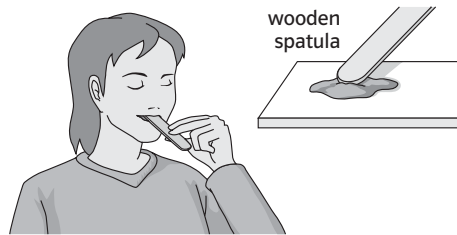
Task 6: Make a labelled drawing of a pondweed cell (size: half a page) on an extra sheet.

Working with the Light Microscope

Examination of human cheek cells

Materials:

- wooden spatula or matchstick
- dilute methylene blue stain
- light microscope
- slides and cover slips
- dropper
- trash can



Vocabulary:

wooden spatula	Holzspatel
matchstick	Streichholz
dilute	verdünnt
methylene blue	Methylenblau
dropper	Pipette
trash can	Mülleimer

Tasks:

- Carefully clean a slide.
- Put a drop of dilute methylene blue stain on the slide. (Careful: Methylene blue stains the desk, your skin and clothes as well!!!)
- Gently rub the wooden end of the matchstick or the spatula against the inside of your cheek.
- Stir the invisible cells attached to the matchstick/spatula in the stain.
- Throw the matchstick/spatula into the trash can provided.
- Place a cover slip over the specimen.
- Observe under low, medium and high powers.
- Determine the size of a cell from the lining of your cheek.
- Record your observations by drawing a labelled sketch of one cell (size: about 5 μm).

Extension:

Why do you think that cheek cells need to be constantly replaced?

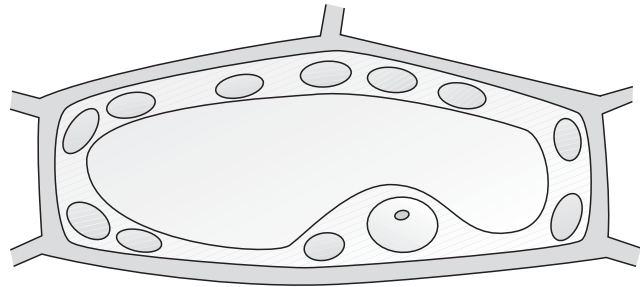
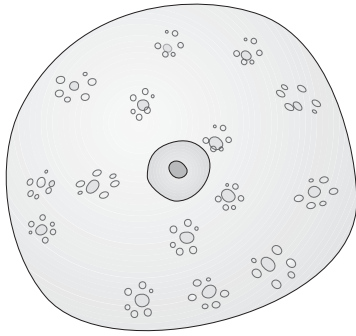
Working with the Light Microscope

Animal versus plant cell

The following diagram shows a generalised animal and a generalised plant cell.

Task 1:

- Label the parts that both animal and plant cells have got in common.
- Take a different colour to label the parts that are found in plant cells only.



Vocabulary:

to surround	umgeben
boundary	Grenze
site	Ort
photosynthesis	Fotosynthese
glucose	Glukose/ Traubenzucker
oxygen	Sauerstoff
carbon dioxide	Kohlenstoffdioxid
to stabilize	stabilisieren
to process	umwandeln

Task 2:

- List the functions of the cell structures in a table.
- Use the vocabulary.

Cell Structures	Functions