The Light Microscope

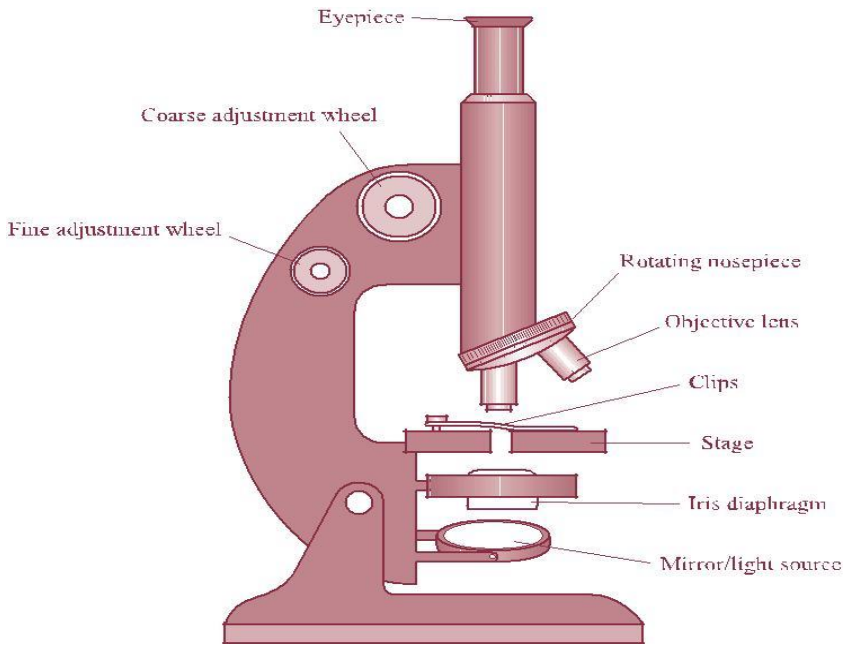
Biology – Leaving Cert

Experiments

Materials and Equipment

Microscope

Prepared Microscope Slides



Procedure

1. Familiarise yourself with all procedures before starting.
2. Switch on the light source and remove the eyepiece cover, if present.
3. Rotate the nosepiece so that the low power lens is used.
4. Put a prepared microscope slide on the stage of the microscope.
5. Move the slide until the object is above the hole in the stage.
6. Use the stage clips to hold the slide in place.
7. Using the coarse adjustment wheel, ensure that the low power lens is at the closest setting to the slide.
8. Look down the eyepiece. Keep your eye about 2 cm from the eyepiece. Adjust the iris diaphragm so that the field of vision is bright but not dazzling. Adjust the position of the slide, if necessary.
9. Use the coarse adjustment wheel to focus the object as sharply as possible. Then use the fine adjustment wheel to sharpen the focus. If necessary, readjust the iris diaphragm so that the specimen is correctly illuminated.
10. To increase the magnification, rotate the nosepiece so that the next highest power objective lens is above the specimen.
11. Refocus using the fine adjustment wheel. Readjust the illumination if necessary.
12. To further increase the magnification, rotate the nosepiece again so that the highest power objective lens is immediately above the specimen.
13. Focus using the fine adjustment wheel only.
14. Magnification is calculated by multiplying the magnification of the objective lens by the magnification of the eyepiece. The magnification of microscope lenses is engraved on the lens casing.
15. Draw labelled diagrams of your observations under low power (L.P.) and high power (H.P.).

16. To further increase the magnification, rotate the nosepiece again so that the highest power objective lens is immediately above the specimen.
17. Focus using the fine adjustment wheel only.
18. Magnification is calculated by multiplying the magnification of the objective lens by the magnification of the eyepiece. The magnification of microscope lenses is engraved on the lens casing.
19. Draw labelled diagrams of your observations under low power (L.P.) and high power (H.P.).

Result

Conclusion/Comment

SKILL ATTAINMENT

BE FAMILIAR WITH AND USE THE LIGHT MICROSCOPE

Following instructions

Familiarise yourself with all procedures before starting
Follow instructions step by step
Listen to the teacher's instructions

Correct manipulation of apparatus

Provide a light source
Remove eyepiece
cover
Rotate nosepiece so that the low power objective lens is being
used Place the slide on the stage
Use the stage clips
Use the coarse adjustment
wheel Use the iris diaphragm
Use the fine adjustment wheel
Use the high power objective
lens
Refocus using the fine adjustment wheel

Observation

See a clear image
Appreciate the importance of the correct placement of the
slide Notice the effect of magnification
See the effect of adjusting the iris diaphragm
Appreciate the use of the coarse adjustment
wheel Appreciate the use of the fine adjustment
wheel

Recording

Write up the procedure
Draw labelled diagrams of your observations

Interpretation

Draw reasonable conclusions from your observations and results

Application

Become aware of any other application(s) of what you learned in this
activity

Organisation

Exercise caution for your personal safety and for the safety of
others Work in an organised and efficient manner
Label as appropriate
Work as part of a group or team
Clean up after the practical
activity

Background information

Microscopes are fundamental biological tools. There are two basic types of light microscope, the compound microscope and the stereoscopic microscope. The compound microscope is used to examine cellular material and gives a magnification of up to □ 400. The specimen has to be translucent. The stereoscopic microscope is used to view whole structures in 3 dimensions.

The most important feature of any lens system is its resolving power. The resolving power of a lens system is the smallest distance separating two objects that can be distinguished by the lens system and that allows them to be seen as two distinct objects rather than as a single entity. For example, most humans see two fine parallel lines as two distinct markings if they are separated by 0.1 mm. If they are closer together we see them as a single line. Thus the resolving power of the human eye is 0.1 mm.

The light microscope has a resolving power of about 0.0002 mm so it gives useful views of cells and can reveal features of some of the sub-cellular contents of eukaryotic cells.

Most microscopes are fitted with three objective lenses, which magnify □ 4, □ 10 and □ 40. The eyepiece lens is usually □ 10. The total magnification is obtained by multiplying the number on the eyepiece by the number on the objective lens.

Helpful hints

- It is advisable to clean the lenses of the microscope regularly using lens tissue. This minimises confusion between debris and unstained cells.
- The objective lenses are preferably cleaned with ethanol-diethyl ether (30:70) on lens tissue or with lens cleaning tissue.
- A common mistake is to have too much light coming through the specimen particularly when viewing under low power. Opening or closing the iris diaphragm will vary the light intensity.
- To locate small objects e.g. single cells, reduce the light intensity by closing the iris diaphragm and traverse the slide methodically.
- Never remove a slide while the high power objective lens is in position. Turn back to the low power first.
- Always treat the microscope with great care. Carry it in both hands and cover when not in use. Allow the lamp to cool before covering and storing.
- Students who wear glasses can remove them for viewing, as microscope adjustments will accommodate most deficiencies in eyesight (except astigmatism). This is more comfortable and stops the spectacle lenses being scratched by the eyepiece holders.