



## Module 9

### Microscope Maintenance

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<b>Purpose</b>	To provide you with an understanding of basic microscope maintenance for better image quality and longer microscope life
<b>Prerequisite Modules</b>	Module 7
<b>Learning Objectives</b>	<p>At the end of this module, you will be able to</p> <ul style="list-style-type: none"><li>▪ Store the microscope properly</li><li>▪ Clean the microscope including the eye pieces and objective lenses</li><li>▪ Replace the microscope bulb</li><li>▪ Troubleshoot the common problems associated with use of microscope.</li></ul>
<b>Content Outline</b>	<ul style="list-style-type: none"><li>• Microscope storage conditions</li><li>• Equipment required for Microscope Maintenance</li><li>• Cleaning solutions and solvent required to clean optics, stage, and body</li><li>• Materials required for cleaning</li></ul>
<b>Handout and Exercises</b>	Demonstration of replacing the microscope bulb
<b>Appendix</b>	Appendix 1: Kohler Illumination

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## Module 9: Microscope Maintenance

Good working knowledge and proper care of the microscope are critical to good diagnostic work.

### MAINTENANCE AND CLEANING

Never attempt to disassemble any part of the microscope for repair. If there is any problem with the microscope, contact the microscope company's technical support unit or a qualified technician.

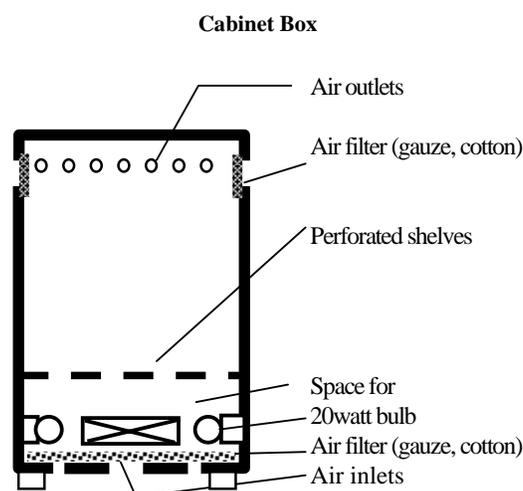
Treat the microscope with care! Never expose it to sharp knocks, vibrations, moisture, dust, or direct sunlight.

Humidity causes fungal growth on the surfaces of lenses and prisms. This can cause cloudiness of the view field and rusting of metal parts of the microscope. To protect from fungus, always keep the glass surface as clean as possible and free of dirt and fingerprints. Reduce the growth of fungus by continuously using an air conditioner to lower humidity. The use of air-conditioning in the daytime only will lead to condensation on the microscope once it is turned off, again favoring growth of fungus. Alternatively, drying the microscope within a temperature-controlled cabinet, silica gel (desiccant), or anti-mold strips may be useful.

### Cabinet box (to control humidity and temperature) (see figure 2)

Store a microscope in a cabinet box with air inlets and outlets for air circulation and a 20-watt bulb for keeping a dry, stable environment.

Figure 2.



### Silica gel

Place dry blue silica gel (about 250 g) in a shallow plate and place it in the bottom of the sealed microscope box. Silica gel is blue when it is dry, but turns pinkish when it becomes wet. As soon as the silica gel becomes pink, replace it. Alternatively, heat the gel until it turns blue again before using it.

### **Anti-mold strips**

Anti-mold strips can be also applied to prevent mold. Replace these strips every 3 years.

Always keep the four optical parts of the microscope (see figure 1) clean. Remove dust attached to the microscope with a blower.

Use only immersion oil with the proper clearness, viscosity, and refractive index for the immersion lens. Cedar oil and other types of oil such as baby oil, cooking oil, and liquid paraffin are not acceptable for this purpose; they will damage the lens.

Before putting the microscope away, wipe off the immersion oil by rubbing the surface of the immersion (100× objective) lens gently with a washed soft gauze or lens paper which is lightly moistened with ethyl ether/alcohol (80/20 vol/vol). This can also be used to remove fingerprints or grease. Remove dust by softly brushing the surfaces. For cleaning lenses and filters, wipe the object from the center, winding a spiral to the periphery.

### **Köhler adjustment**

August Köhler invented the procedure for optimum illumination of object in a light microscope. It is also know as double diaphragm illumination because it employs both a field and an aperture iris diaphragm to set up the illumination. If the light path is set up properly, you will have the advantages of an evenly illuminated field, a bright image without glare and minimum heating of the specimen. Refer to appendix -1 for procedure on adjusting Köhler illumination.

Note: In economical microscopes, field diaphragm is usually not present; therefore, Kohler adjustment does not apply.

## **TROUBLESHOOTING**

There are several conditions that can affect good function of the microscope. Review these problems and their solutions.

### **1. The brightness of the viewing field is poor.**

<b>Problem</b>	<b>Solution</b>
The condenser is too low.	Raise the condenser to correct its position.
The condenser iris diaphragm is closed.	Open the diaphragm properly.

### **2. There are dark shadows in the field which move as you turn around the eyepiece.**

<b>Problem</b>	<b>Solution</b>
The surface of the eyepiece has scratches.	Replace the eyepiece.
The eyepiece is dirty.	Clean the eyepiece.

### 3. The image with the high power objective is not clear.

Problem	Solution
The slide is upside down.	Turn the slide over.
There is an air bubble in the oil.	Move 100x lens quickly from side to side.
There is dirt on the objective.	Clean the lens.
The oil is too sticky.	Use thinner immersion oil or specified immersion oil.

### 4. The image with the low power objective is not clear.

Problem	Solution
There is oil on the lens.	Clean the lens.
There is a layer of dust on the upper surface of the objective.	Clean the lens.

**If the view field is still dim and cloudy, consider the following possible causes:**

- Massive growth of fungus on the lenses or prisms due to storage in a high humidity environment
- Penetration of immersion oil between the lenses of the objective through damaged lens cement (due to use of poor-quality oil such as cedar oil or misuse of xylene), this is very probable cause if a completely hazy field becomes clear after changing the objective.
- A damaged objective (due to careless focusing, dropping, rough changing of sides)

**Frequently-encountered operational errors include the following:**

- Focusing the first slide using the 100x immersion objective without passing through a low power
- Changing slides from under the immersion objective without turning it away first
- Wiping lenses without first blowing away dust and sand
- Cleaning lenses or other parts with xylene
- Using cedar wood oil, liquid paraffin, or xylene-diluted oil instead of pure synthetic immersion oil
- Keeping the microscope in a confined space without ventilation in a humid climate

## LOGBOOK

A microscope logbook should be maintained to enter problems encountered in the operation of microscope, maintenance schedule, repairs done on the microscope and availability of spares like bulbs, fuses, anti-mold strips etc.

### Key messages



- Never attempt to disassemble any part of the microscope for repair.
- Treat your microscope with care! Never expose it to sharp knocks, vibration, moisture, dust and sunlight.
- Familiarize yourself with all working parts of the microscope.
- Call for help when troubleshooting any problems in function.



## Module Review 9

Find out how much you have learned by answering these questions.

**What is another term for “eyepiece”?**

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**What are two reasons for problems with brightness of the viewing field?**

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**Define the purpose of a cabinet box.**

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## Appendix 1

### **Setting of Köhler Illumination for Light Microscope**

1. Plug in the microscope and turn on the illuminator. Rotate the nosepiece so that the 10X objective is locked into place.
2. Put the specimen slide on the stage and center it under the 10X objective.
3. If there is a swing out (flip) condenser, be sure it is in the light path. Adjust the intensity of the light to a comfortable level with the transformer.
4. Open the field diaphragm all the way and close the condenser diaphragm all the way.
5. Move up (rack up) the stage to its highest position.
6. Adjust the oculars for interpupillary distance so that when looking with both eyes only one circle of light is seen.
7. Rack up the condenser as high as possible with the height adjustment knob.
8. Close the field diaphragm half way and focus on the specimen at 10X using the coarse adjustment knob.
9. Close the field diaphragm until the diameter of the illuminated image is smaller than the field of view. Note: If there is a flip condenser, it may need to be swung out at this time to achieve this view of the illuminated image.
10. Lower the condenser with the positioning knob until a sharp, focused image of the edges of the field diaphragm is achieved.
11. Using the centering screws on the side of the condenser, adjust the condenser so that the circle of light is centered in the field.
12. Open the field diaphragm until the illuminated image is just larger than the field of view. If more light is needed, use the transformer.

*Köhler illumination is now set.*