



Tishk international university  
Faculty of science  
Medical analysis Department  
Biology Module: Practical

## Lab 2

# Light Microscope and Lab safety



# Aims

1. Familiarize students with laboratory rules and safety cautions
2. Familiarize students with parts of **light microscope**
3. Familiarize students with magnification power and power of each lens
4. Familiarize students for using of light microscope to see biological specimens at different magnifications levels
5. Explain Procedure for cleaning a microscope
6. Explain procedures for cleaning a microscope slide

## General laboratory rule and safety precaution.

1. Follow all instructions carefully. Use special care when you see the word CAUTION in your laboratory instructions. Follow the safety instructions given by your teacher.
2. Determine the location of Fire Extinguishers, Chemical safety showers and Eye washers, Chemical Spill Kits, and alternative exit routes for lab evacuation.
3. Remember that smoking, eating, or drinking in the lab room is totally prohibited.
4. Wear lab aprons when working with chemicals, hot material, or preserved specimens.
5. Wear safety goggles when using dangerous chemicals, hot liquids, or burners.





Harmful



Explosive



Corrosive



Dangerous  
for the  
environment



Flammable



Toxic



Oxidizing



Radioactive



Biohazard



Poison



Oxidizing



General danger



Explosive



Flammable



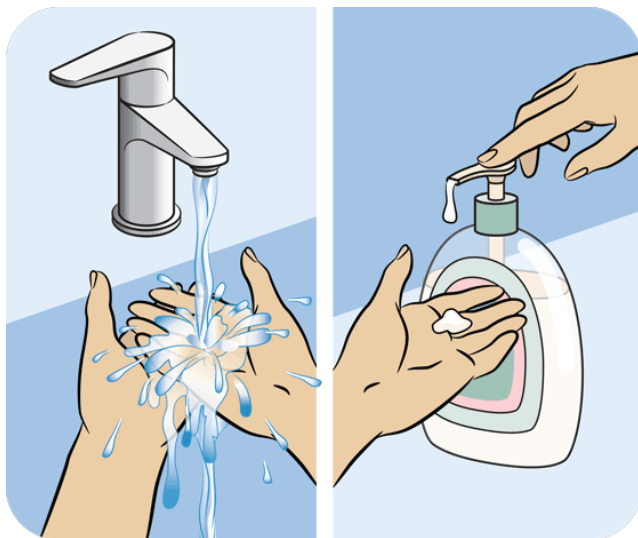
Electrical hazard

6. Any chemicals spilled on the hands or other parts of the skin should be washed off immediately with a plenty of running water.
7. If you have an open skin wound, be sure that it is covered with a water proof bandage.
8. Never work alone in the laboratory.
9. Keep your work area clean & dry.
10. Turn of all electrical equipment, water, and gas when it is not in use, especially at the end of the laboratory period.
11. Tie back long hair.
12. Report all chemicals spills or fluids to your instructor immediately for proper clean up.



# Special precautions for working with chemicals.

1. Never taste or touch substances in the laboratory without specific instructions.
2. Never smell substances in the laboratory without specific instructions.
3. Use materials only from containers that are properly labeled.
4. Wash your hand after working with chemicals.
5. Do not add water to acid. Instead, dilute the acid by adding it to water.
6. Mix heat generating chemicals slowly.



# Special Precaution for working with Glassware and other laboratory equipment.

1. Become familiar with the names and appearance of all the laboratory equipment you will use.
2. Never use broken or chipped glassware.
3. Make sure that all glassware's are clean before you using it.



4. Do not pick up broken glass with your bare hands. Use a pan and a brush.



5. If a Mercury thermometer breaks, do not touch the mercury. Notify your teacher immediately.



6. Use care handling all sharp equipment, such as scalpels and dissecting needles

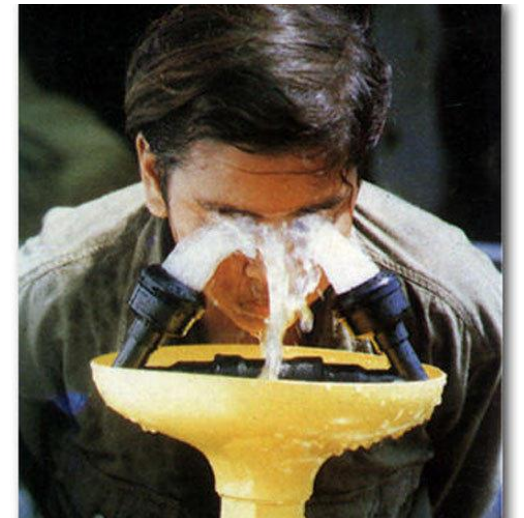




# First Aids

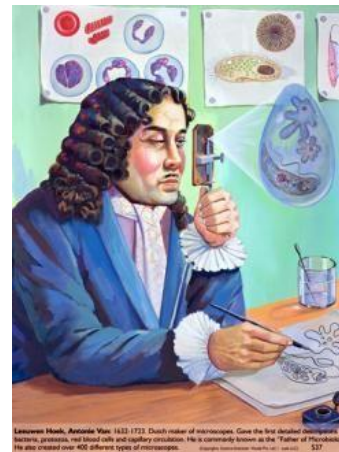
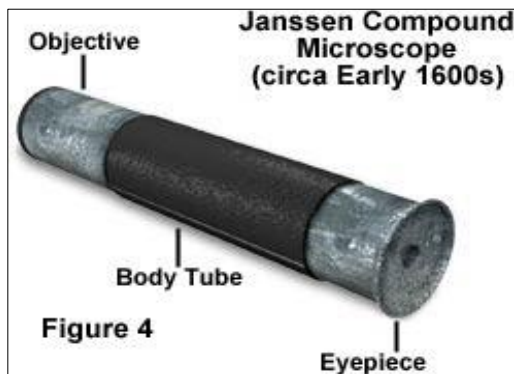


- 1. Injuries:** bleeding should be reduced using bandages; the wound should be cleaned with iodine alcohol mixture, and wrapped with sterile bandage.
- 2. Acid and fire burns:** body burns must be washed immediately with tap water. Eye burns must be washed using eye washer, special cream for burns can be used.
- 3. Poisoning:** if any toxic chemical is swallowed, the mouth must be sensed with water, in case of acid, milk is drunk, in case of alkaline, diluted acetic acid ( vinegar) can be used.
- 4. Skin contamination** requires washing with water and removal of contaminated clothing, if the contaminant is insoluble in water remove with soap and water



# The Microscope

- Since an unaided eye cannot detect anything smaller than 0.1 mm in diameter, cells, tissues, and many small organisms are beyond our visual capability, so we need equipment to magnified objects which is too small to be seen with unaided eye.
- **Microscopes** are fundamental biological tools. Most of our current knowledge of cell structure has been gained with the assistance of microscopes




- There are **several types** of microscopes but the only one used in this laboratory is the **compound light microscope**.
- **The compound microscope** (sometimes called the student microscope or light microscope); these microscopes are known as compound microscope because there are two magnifying lenses in the microscope.
- One magnifying lens is in the ocular or eyepiece, which further magnifies the image formed by the objective lens, and one, is in the objective. Each contributes to the magnification of the object on the stage.



**Magnification:** the degree to which something is or can be magnified.

**Calculating total magnification**



Eyepiece lens

Objective lens

Total magnification = eyepiece lens x objective lens

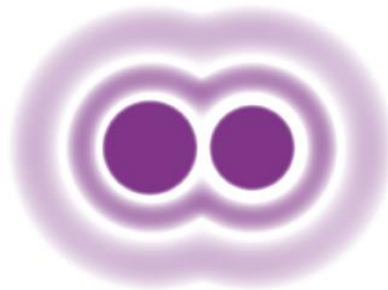
For example, for an **eyepiece of  $\times 10$**  and an **objective of  $\times 10$** , the total magnification of the object is:

$$10 \times 10 = 100$$

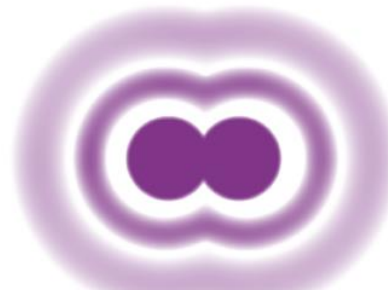
The nose piece rotates the magnification of the microscope. Generally compound microscope magnifies from 40 x to 1000 x.

The most important feature of any lens system is its resolving power

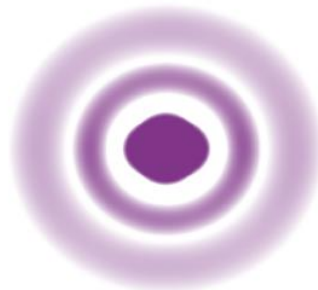
- **The resolving power** of a lens system is the smallest distance separating two objects that can be distinguished by the lens system and that allows them to be seen as two distinct objects rather than as a single entity



Fully resolved



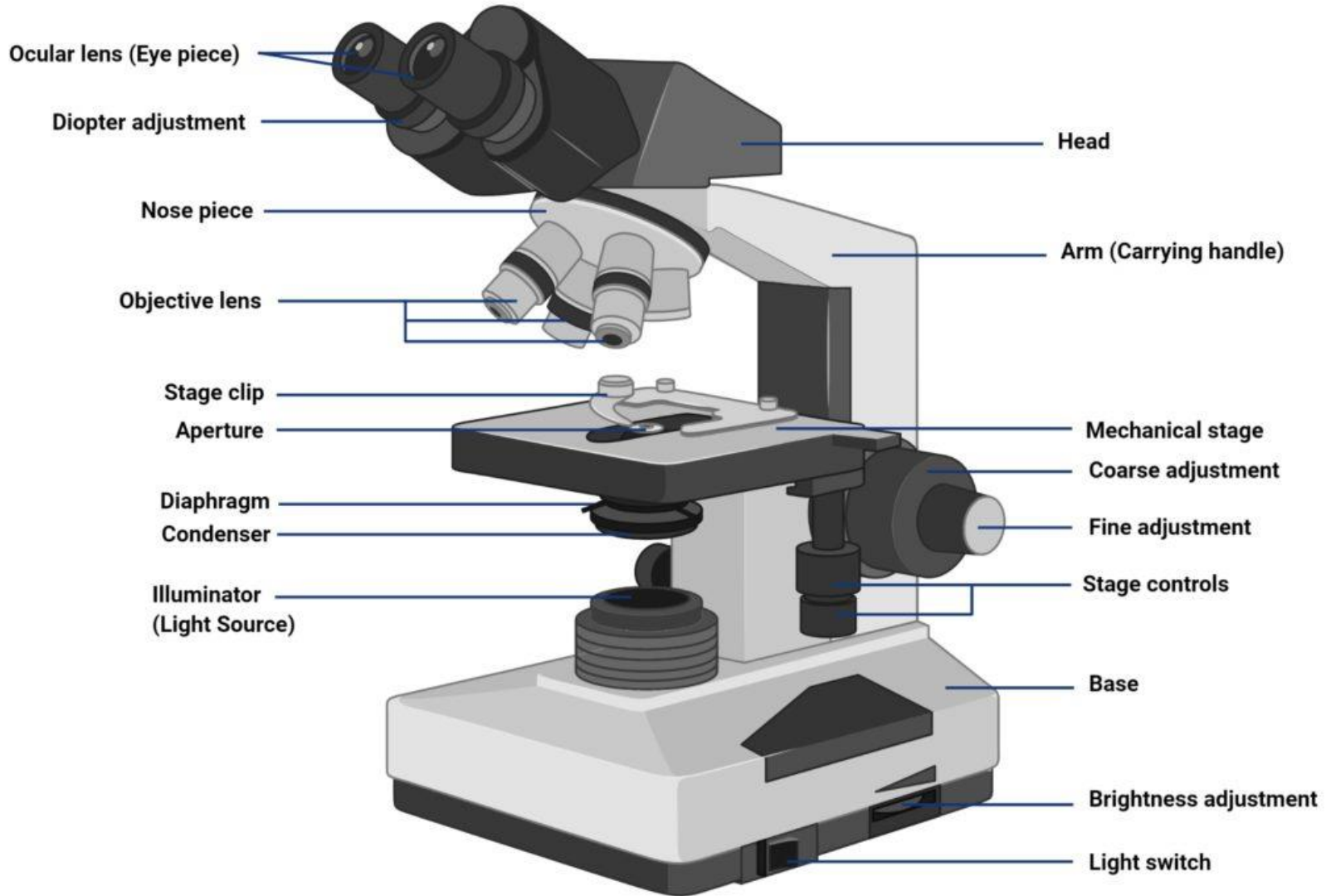
Just resolved



Unresolved

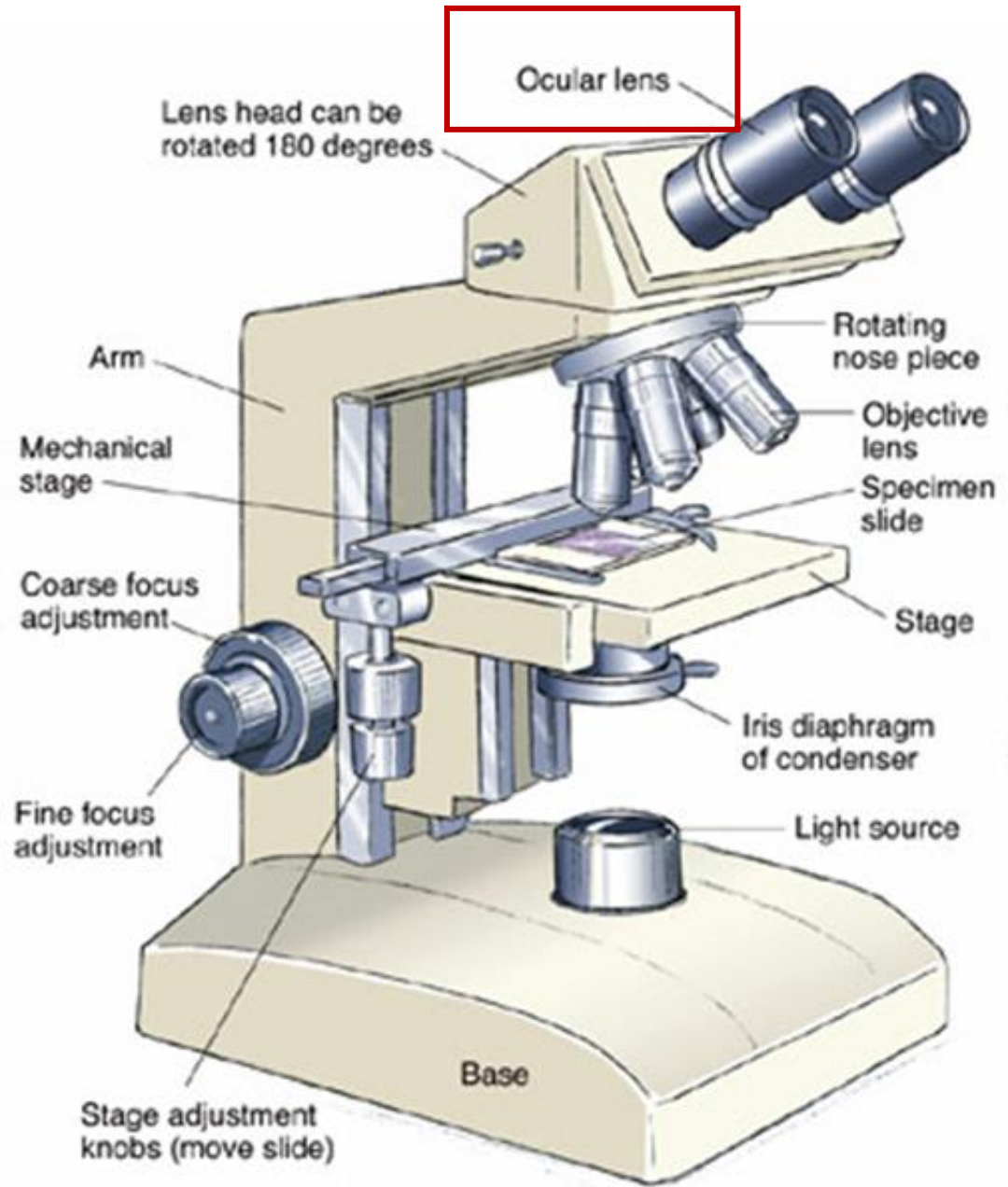
- For example, most humans see two fine parallel lines as two distinct markings if they are separated by 0.1 mm. If they are closer together we see them as a single line.
- Thus the resolving power of the human eye **is 0.1 mm**.
- The light microscope has a resolving power of about **0.0002 mm** so it gives useful views of cells and can reveal features of some of the sub-cellular contents of eukaryotic cells.

# Microscope Parts



## 1. Ocular of eyepiece lens.

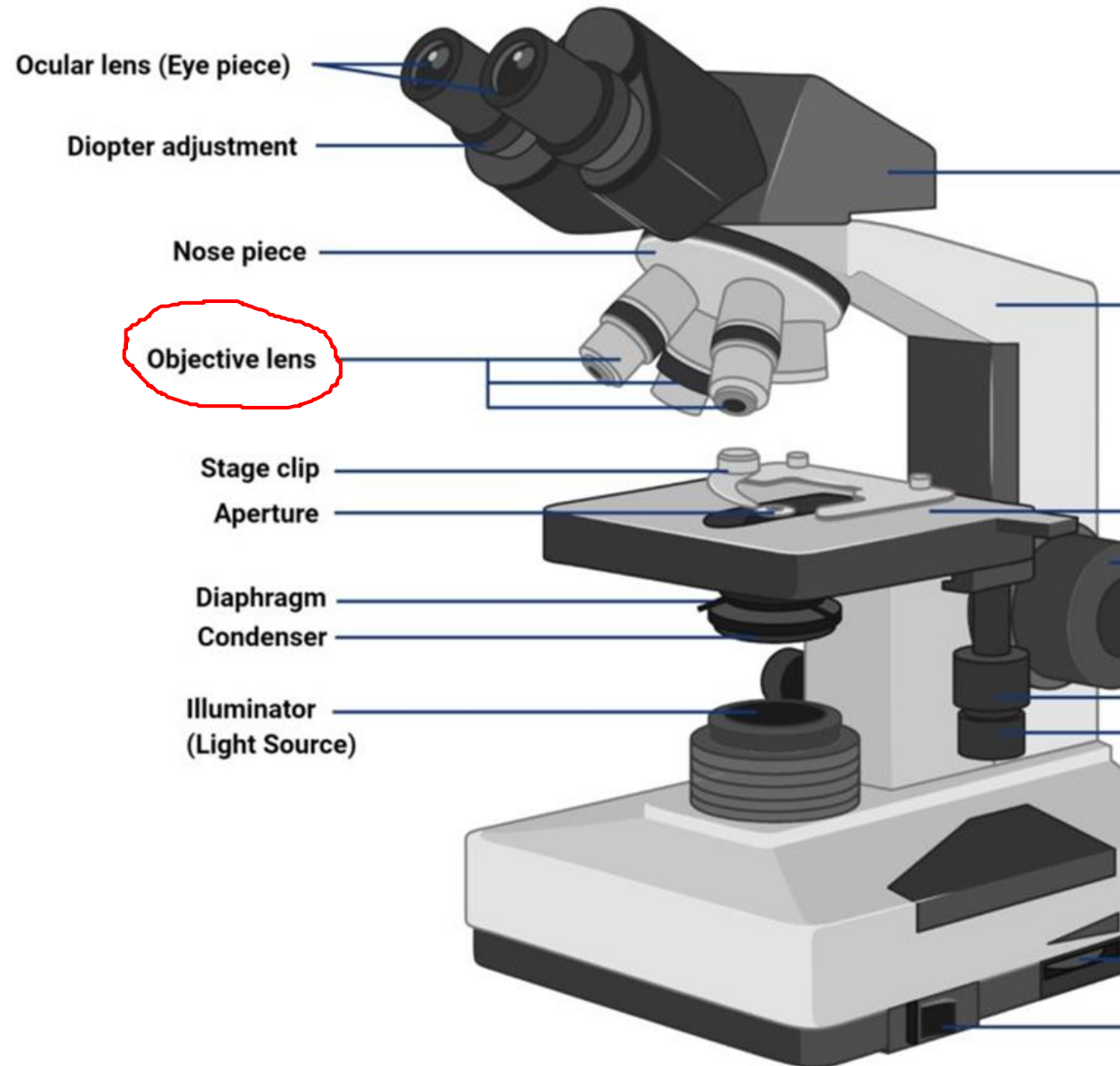
- The ocular lens is the lens you look through, it is inserted at the top of the body tube. If your microscope has one ocular, it is a monocular microscope, if it has two, it is binocular. Its magnification is written on it (Mostly 10 x)





## 2. Objective lenses.

- The objective lenses are a set of three to four lenses mounted on a rotating turret at the bottom of the body tube. The four objective lenses of your microscope and their magnifications are:



Scanning lens	4X magnification
Low power lens	10X magnification
High power lens	40-45X magnification
Oil immersion lens	100X magnification



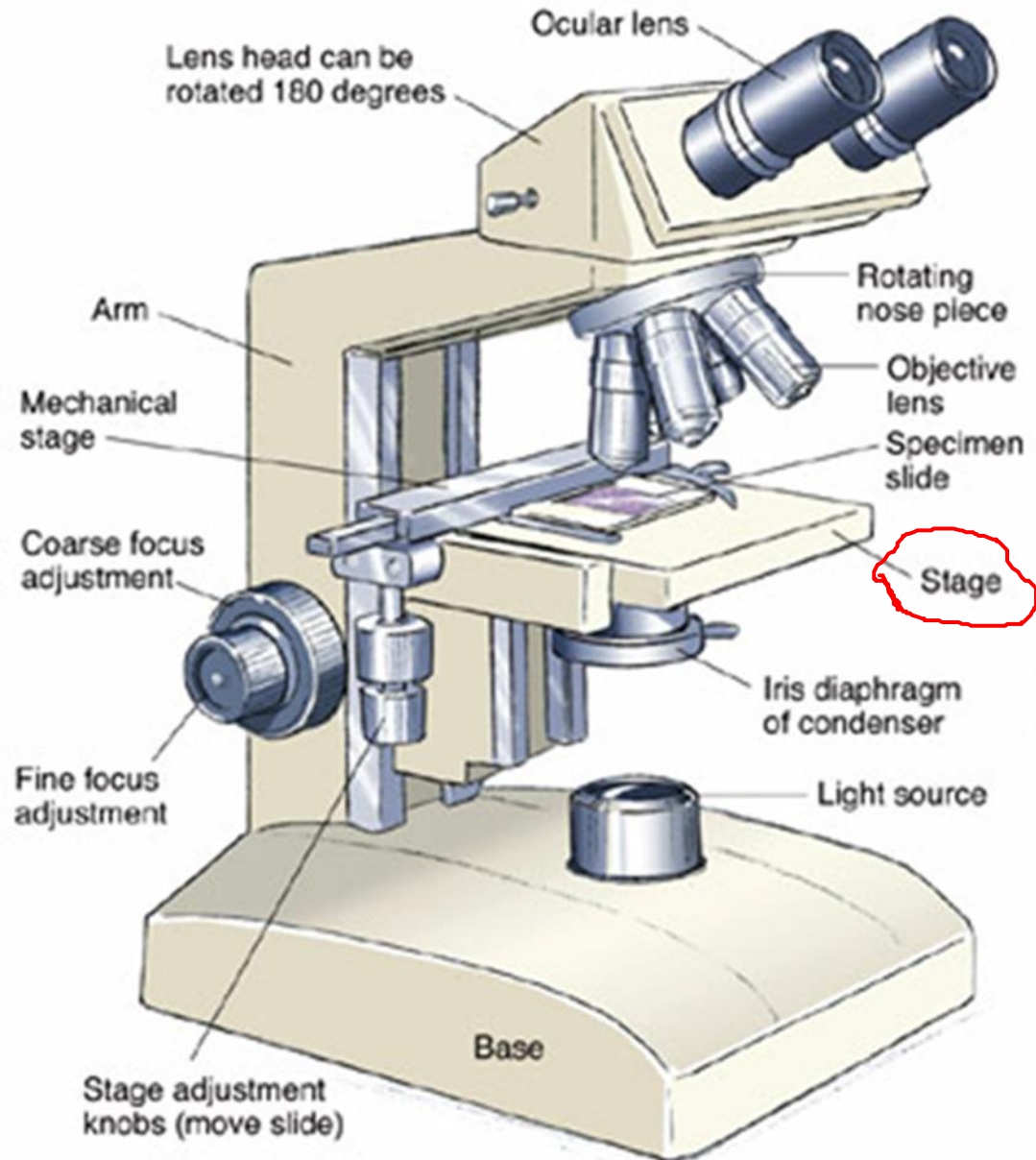
The magnification of the objective lens is written on the lens.

**Note:** with the exception of the oil immersion lens all the objective lens is used dry.

The magnification of oil immersion lens requires using the lens with special immersion oil for proper resolution.

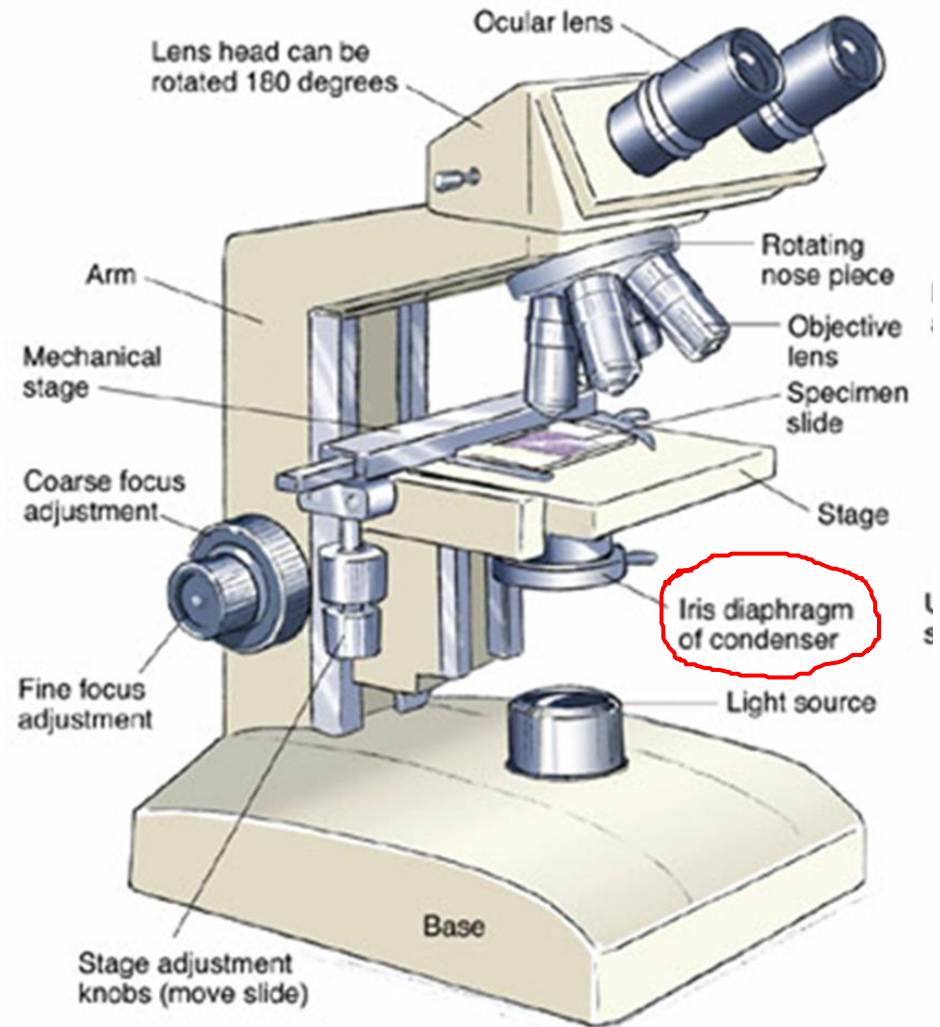
## 3. Stage

- The horizontal surface on which the slide is placed is called the stage. It may be equipped with simple clips for holding the slide in place or with a mechanical stage, a geared device for precisely moving the slide. Two knobs, either on top of or under the stage, move the mechanical stage

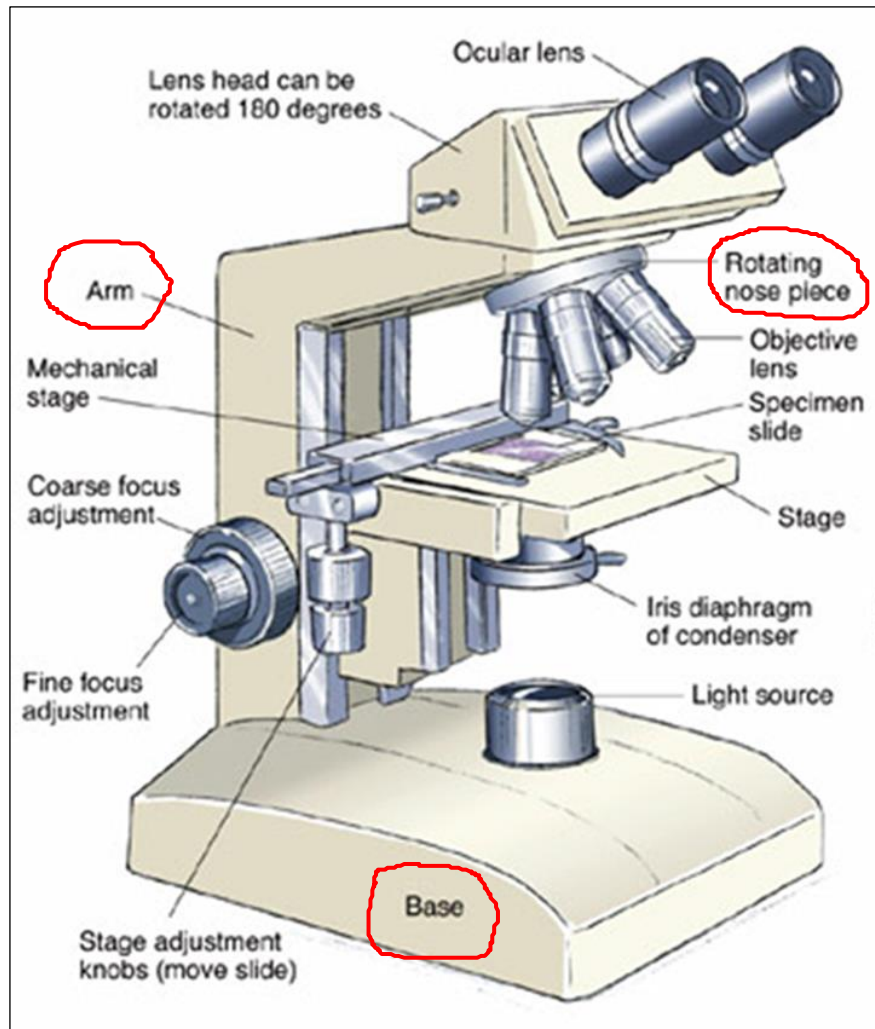


# 4. Iris diaphragm

- Iris diaphragm is located below the condenser or immediately below the stage in microscopes without a condenser. It functions in regulating the light intensity passing through to the stage. More light is required at higher magnification

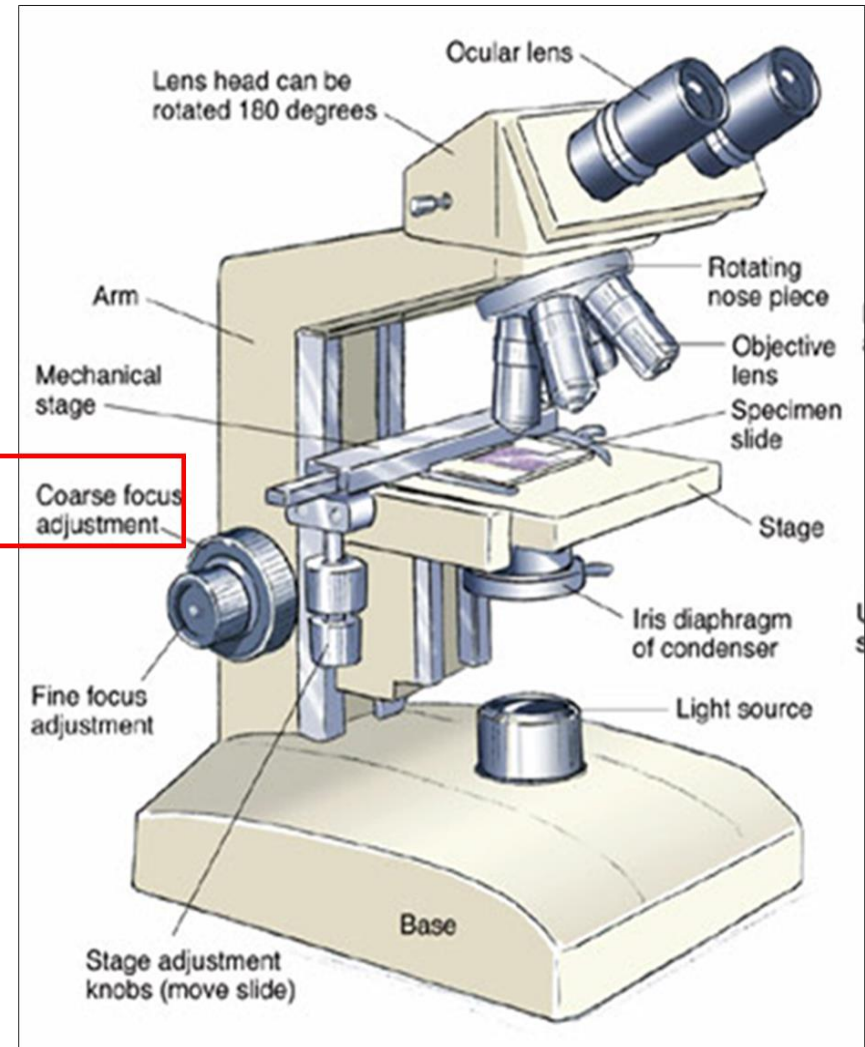


5. **Base:** Base – also called the supporting stand, rests on the bench.
6. **Body Arm:** The body arm is used when carrying the instrument.
7. **Nose piece:** Nosepiece is the mounting for the objective lenses which rotates to bring the desired objective into position.



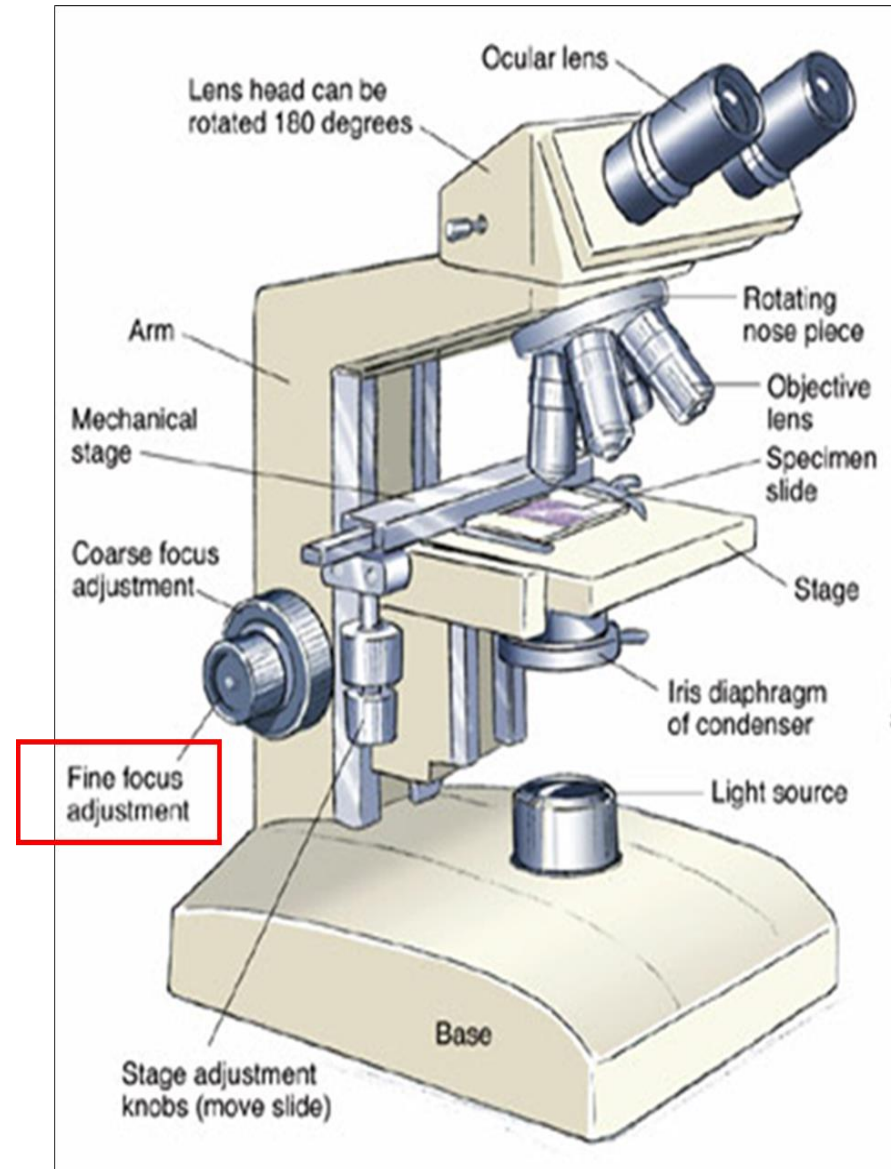
## 8. Coarse adjustment

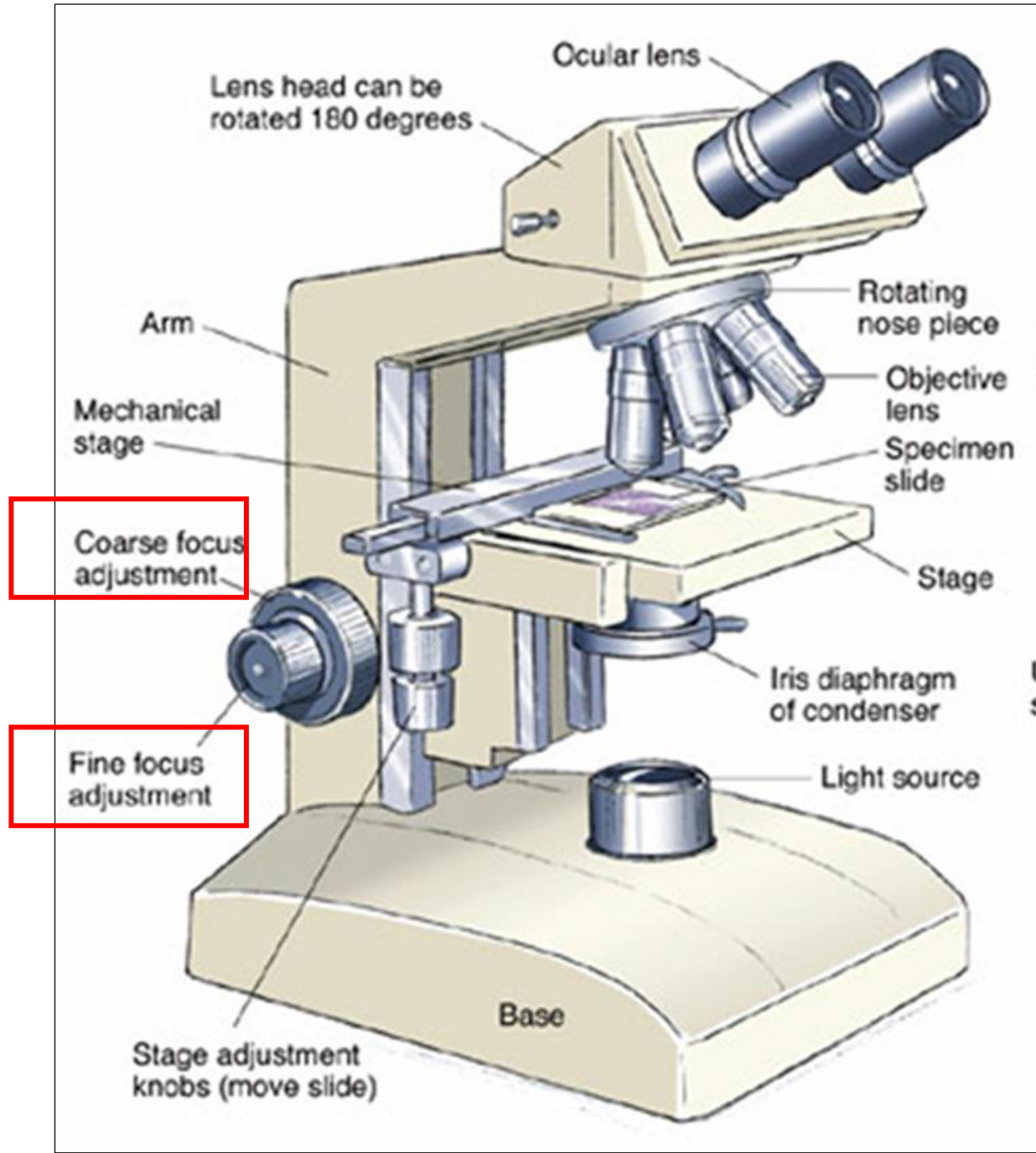
- Coarse adjustment knob is a large knob located at either side of the microscope which functions in controlling the distance between the objectives and the stage. Use the coarse adjustment **only with the scanning (4X) & low- power (10X) objectives. Why?** So coarse adjustment is used for rapid focusing of the specimen until the specimen is roughly in focus & then left alone, in which the fine adjustment knob controls precise focusing of the object.



## 9. Fine adjustment

- Fine adjustment is a small knob located at either side of the microscope. This is used for the control of the object, precise focusing you should use just the fine adjustment knob with the higher magnification objective lenses; Because using the coarse adjustment knob with the higher objective lenses may damage the lens &/or the slide you are observing.







# Microscope safety cautions:

1. Always carry the microscope in an upright position using both hands.
2. Keep the microscope away from the edge of the table.
3. **Always examine a slide first with the low-or medium power objective, never use the high – power objective to view thick specimens.**
4. **Remove slide only after low-power objective has been rotated into viewing position, never when high – power objective is in position.**
5. Keep the stage dry at all times. A wet stage will prevent the slide from being accurately positioned.
6. When returning your microscope to its proper place in the cabinet always:
  - a) Remove the slide from mechanical stage.
  - b) Clean all lens surface and the stage.
  - c) Rotate the nosepiece that the scanning lens is in place

# Steps Used in viewing a slide:

1. Obtain a slide.
2. Check that the ocular and all objective lenses as well as the slide clean.
3. Use the coarse adjustment knob to obtain maximum working distance.
4. Place the slide on the stage, the slide should fit into the slide holder. Use the stage adjustment knob to move the slide over the hole in the stage.
5. Rotate the lower objective in place.
6. Look through the ocular. Adjust the light with the iris diaphragm level if necessary. Slowly turn up the coarse adjustment knob until something comes into focus. Use the fine adjustment knob to sharpen the focus.

8. Using the stage adjustment knob move the slide around until you find an area you wish to examine more closely. Move the slide until the object you wish to examine is in the center of the field.
9. Rotate the high-power objective into place. Use the fine adjustment knob to sharpen the focus. **Do not use the coarse adjustment knob.** Adjust the light using the iris diaphragm lever if necessary.
10. Rotate the high-power objective halfway to the next position, place a drop of immersion oil on the slide, and then rotate the oil immersion objective into place. The objective should be immersed in the oil on the slide. Use the fine adjustment knob to sharpen the focus. Adjust the light using the iris diaphragm lever if necessary.
11. **When finished viewing the slide use the coarse adjustment knob to maximize the working distance and remove the slide from the stage. If you are finished with the microscope clean the microscope and return it to storage.**

## Procedure for cleaning a microscope:

1. Turn off the light.
2. Using the coarse adjustment knob to obtain maximum working distance and remove the slide from the stage.
3. Using lens paper cleans all the lenses starting with the **cleanest first ocular**, and objectives lens.
4. Clean any oil off of the stage using paper towels.
5. Rotate the scanning objective into place. Use the coarse adjustment knob to obtain minimum working distance.
6. Cover the microscope with its **plastic cover** and Return the microscope to the appropriate storage area .