# Basic operation of a compound microscope and auto-pipette

**Compound Microscope**

Model of the compound microscope: Nikon Eclipse E100

Magnifying power of eyepiece: 10X

***Points to note****:*

*Adjust the* coarse *adjustment knob before the fine adjustment knob, use the objective lens with low magnifying power before the one with high magnifying power.*

**Steps**

1. Connect the microscope to a power supply and press the power switch from “□” to “I”.
2. Lower the stage to the lowest limit by rotating the coarse adjustment knob.



1. Bring the objective with the lowest magnifying power to the optical path by rotating the nosepiece (facing down vertically).





Magnifying power   
of objective

1. Place your sample (on a glass slide) on the stage carefully and mount the sample slide with the clips. Make sure that the cover slip and the sample slide are facing upward.



1. Use the stage motion knobs to adjust the position of the sample until it aligns with the objective lens.
2. To set focus to a view, you might adjust the width of the eyepieces.
3. You shall first make sure that you are starting with the objective of the lowest magnifying power (4X). The total magnification now is 40X n.
4. Get the rough outline of the cell by rotating the coarse adjustment knob.



Rough outline



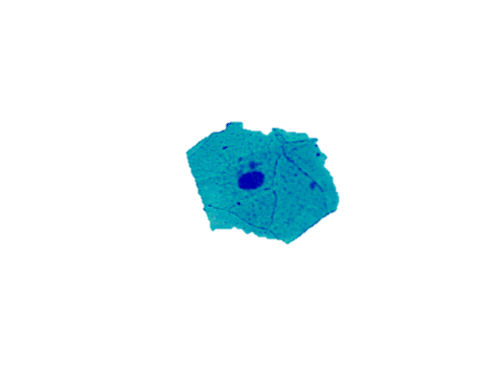
1. Rotate the fine adjustment knob gradually until the observed image becomes sharp and clear.

Course adjustment knob

Fine adjustment knob



Sharp and clear image



1. Switch to the objective lens of higher magnifying power (i.e. 10X) by rotating the nosepiece. Rotate the fine adjustment knob gradually until the observed image becomes sharp and clear again. The total magnification now is100X.
2. Repeat “step 10” by using the objectives of higher magnifying power (i.e. 40X and 100X) to achieve the total magnification of 400X and 1000X, respectively.

|  |  |  |
| --- | --- | --- |
| **Total magnification** | **=** | Magnifying power of eyepiece |
| × |
| Magnifying power of objective |

**Parts of a compound microscope**



Fine adjustment knob

Coarse adjustment knob

Clips



Magnifying power   
of Eyepieces

**Eyepieces**



Magnifying power   
of objective

**Objective**



Brightness Control  
knob

Coarse and fine adjustment knobs

Objectives

Stage

Nosepiece

Clips

Eyepieces

Stage motion knob

Power switch

Eyepiece tube screw

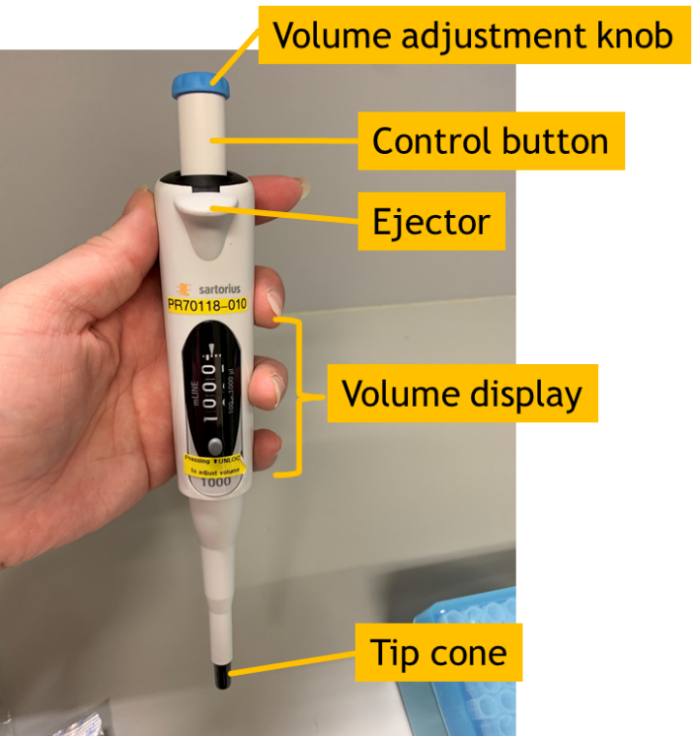
*Reference: Nikon Eclipse E100 Instruction manual*

**Auto-pipette**

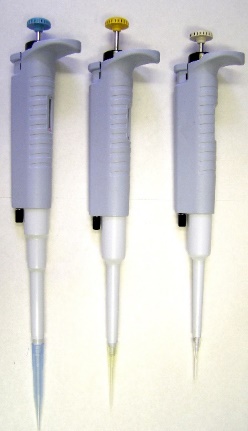
***Points to note****:*

*The commonly used units for volume in auto-pipettes are milliliters (mL) and microliters (µL), where 1 milliliter (mL) = 10-3 liters(L) = 1000 microliters (µL); 1 microliter (µL) = 10-6 liters(L)*

**Parts of auto-pipette**

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**Steps:**



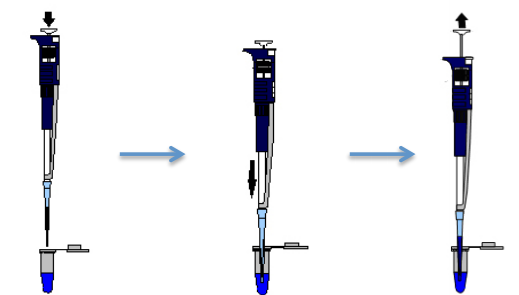
1. Look at the top of the control button to see the pipette size. Choose the auto-pipette which suits the volume you need to pipet.

|  |  |
| --- | --- |
| Volume to be pipetted | Model of auto-pipette to be used |
| 0.2-2μL | grey P2 pipette |
| 2-20μL | yellow P20 pipette |
| 20-200μL | yellow P200 pipette |
| 200-1000μL | blue P1000 pipette |

1. Fit the tip cone firmly into a pipette tip (of appropriate size). Make sure they are securely attached.
2. Turn the volume adjustment button gently to choose the volume required. We can read the volume display for different models of auto-pipette as shown in the table below.

|  |  |
| --- | --- |
|  | For **P1000 auto-pipettes**, the numbers should range from 020 and 100.   * the top red number is the thousands digit; * the middle number is the hundreds digit; * the lower number is the tens digit   If 350μL of liquid has to be pipetted, the setting should be as shown on the left. |
|  | For **P200 auto-pipettes**, the numbers should range between 020 and 200.   * the top number is the hundreds digit; * the middle number is the tens digit; * the bottom number is the ones digit   If 95μl of liquid has to be pipetted, the setting should be as shown on the left |
|  | For **P20 auto-pipettes**, the numbers should range from 020 to 200.   * the top number represents the tens digit; * the middle number represents the ones digit; * the bottom red number represents the tenths digit   (There is a decimal between the middle and bottom number)  If 2.5 μL of liquid has to be pipetted, the setting should be as shown on the left. |
|  | For **P2 auto-pipettes**, the numbers should range from 020 to 200 with this pipette.   * the top number represents the ones digit; * the second red number represents the tenths digit; * the bottom, red number represents the hundredths digit   If 0.5μl of liquid has to be pipetted, the setting should be as shown on the left. |

1. Press the control button down to the first stopping point. Do not push the control button all the way down.
2. Only insert the plastic pipette tip into the water sample you wish to pipet.
3. Once the tip is suspended in the water sample, slowly release the control button to its starting point. Then, remove the plastic tip from the liquid.

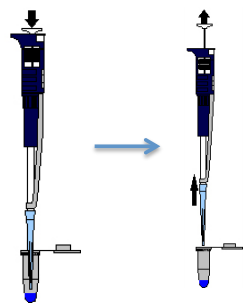


Step 4:

Step 5:

Step 6:

1. Insert the pipette tip into the target container (e.g. centrifuge tube). Push the control button down all the way. (The button should pass the first stopping point and reach the second stopping point where you cannot push the control button down any further.) The water sample should now be pipetted into the target container. Do not release the control button until all the water sample is released.
2. Lift the tip from the container. Once the tip is removed from the container, you may release the control button to its starting point.



Step 7:

Step 8:

1. Usually, the pipette tip is for single-use to avoid contamination. To dispose of it, press down on the ejector to release the tip into a bag /a beaker.

***Points to note****:*

* Never attempt to pipet a volume outside of the specified volume range for each auto-pipette.
* Avoid touching plastic pipette tips with your hands, or to the working bench, or any other objects that could cause contamination.
* Usually the pipette tip is for only single-use to avoid contamination.
* Use gentle and controlled movements when using the control button, otherwise, the auto-pipette will be damaged and its measurement accuracy will be adversely affected.

*Reference:* <https://sites.psu.edu/nicolehume/files/2013/12/micropipette-19e15kr.pdf>