Objectives

- Describe the function of the each of the major parts to a compound light microscope (CLM).
- Explain how to get a specimen in focus using a CLM.
- Explain the importance of using a common system of measurement, specifically the SI System.
- Describe how to use proper lab techniques and explain why they are important.

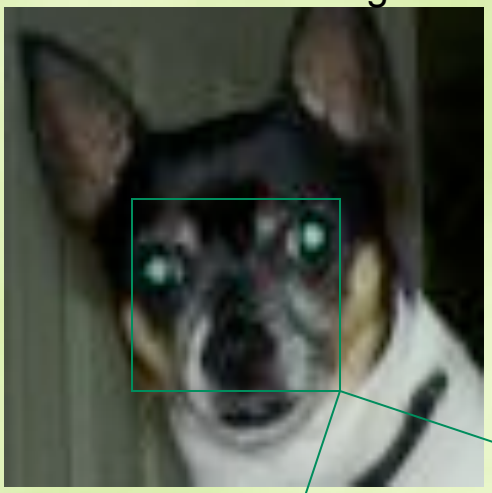
Tools of the Trade

- Because many things are too small to see with the naked eye, biologists often use microscopes to get a better look.
- The most common type of microscope is a Compound Light Microscope, which forces light through a specimen that is being view through a magnifying lens.
- Another type of microscope is an Electron Microscope, which uses a beam of electrons to produce images.
- Electron Microscopes provide a much clearer image and greater magnification, but are also very expensive.

Magnification vs. Resolution

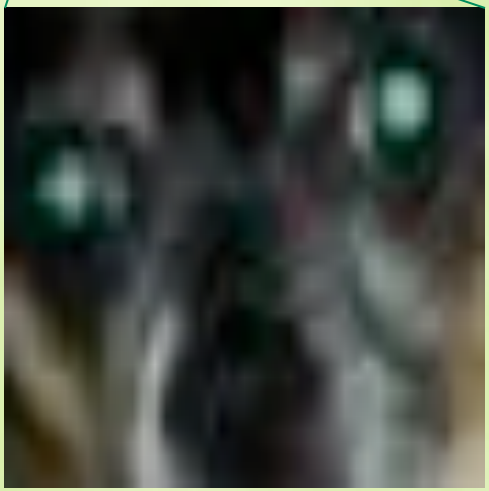
- Magnification describes how much larger something appears in a microscope.
  - As your magnification increases, the object appears bigger, but the amount you are able to see reduces.
- Resolution refers to how clear something appears in a microscope.
  - As the magnification increases, you are able to see to object bigger, but less clearly.

Magnification = 1X



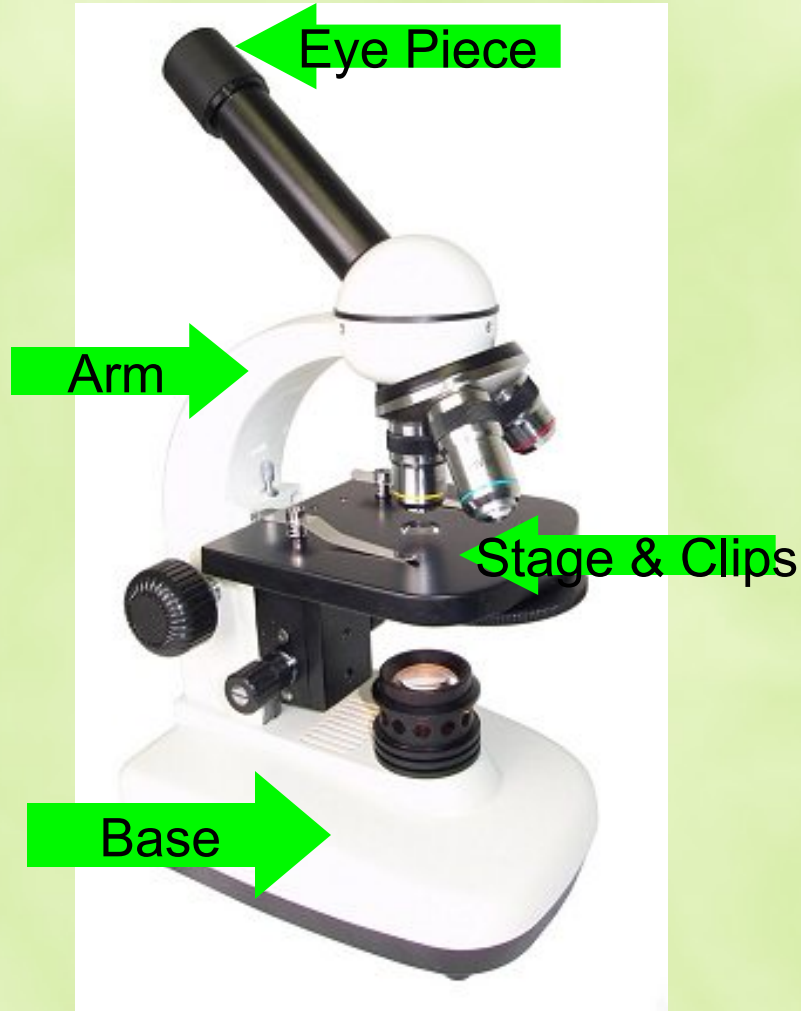
Magnification = 5X

(5X means 5 times the original size.)



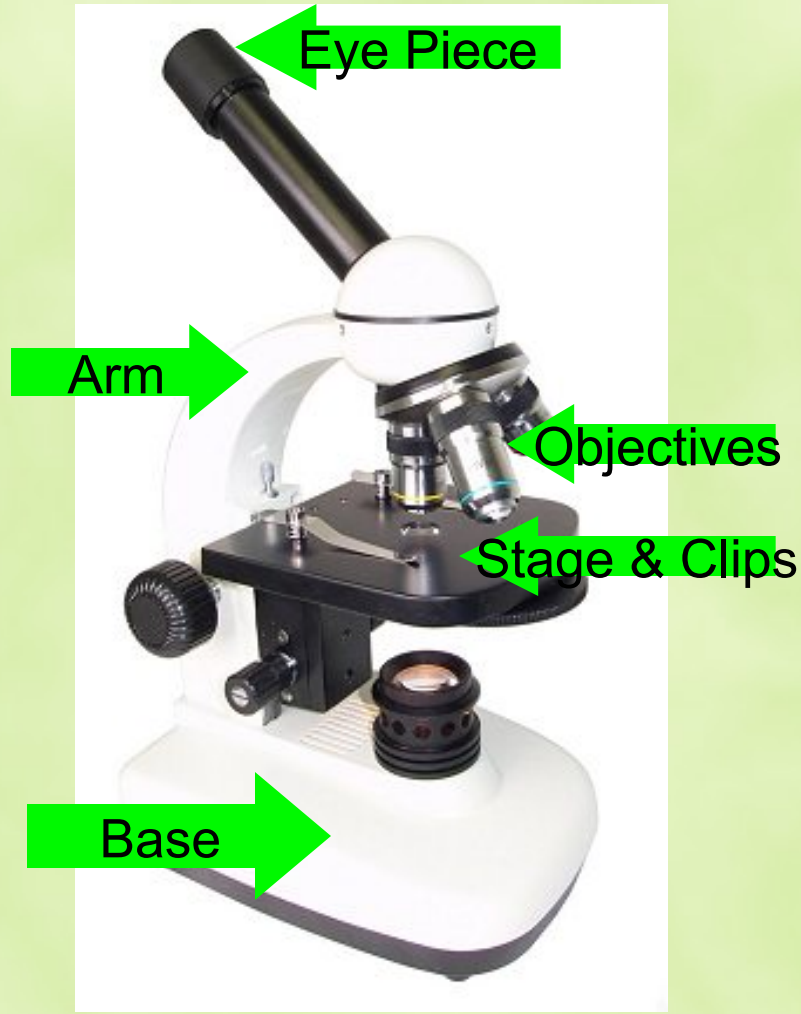
The Anatomy of a Microscope

- Each part of a microscope has a specific job.
- Eyepiece: Provides additional magnification (usually 10x) and an opening to view the specimen.
- Arm: Holds the eyepiece the correct distance from the specimen.
- Base: Allows the scope to sit flat.
  - When carrying a scope one hand should be on the arm with the other under the base.
- Stage & Clips: Provides a platform to hold the specimen in place.

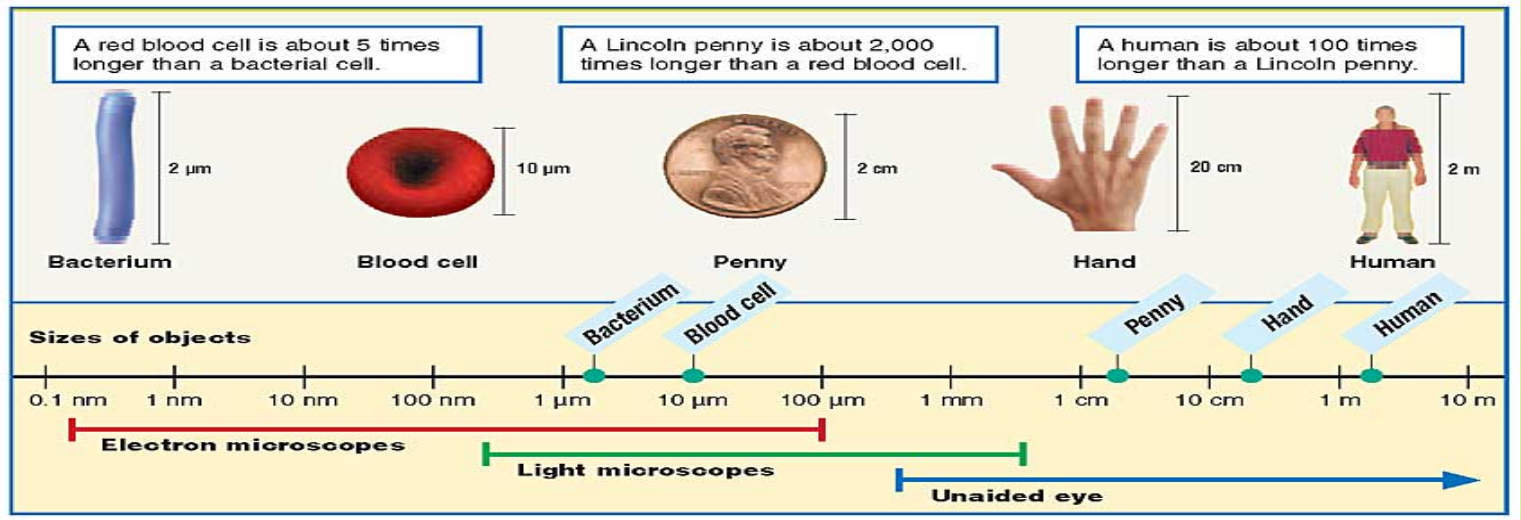


Magnification and Objectives

- The objectives are the lenses that magnify the specimen
- Scanning Power: The lowest magnification, used to locate and focus the scope.
  - Usually 4x
- Low Power: Provides an increased magnification from scanning power and narrows field of view.
  - Usually 10x
- High Power: The highest magnification on a CLM with the lowest resolution, further narrows field of view.
  - Usually 40x
- The total magnification of a scope is the magnification of the eyepiece multiplied by the magnification of the objective.
  - EXAMPLE: On low power, Eyepiece is 10x and low



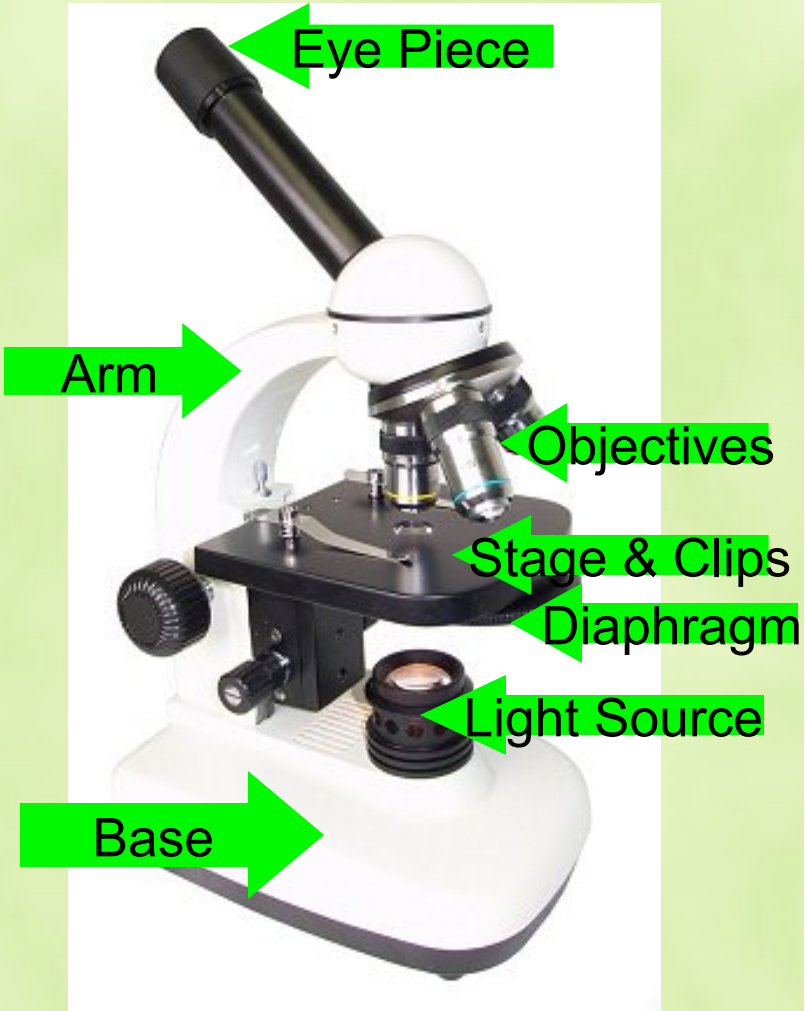
Total Magnification



- The total magnification of a scope is the magnification of the eyepiece multiplied by the magnification of the objective.
  - EXAMPLE: On low power, Eyepiece is 10x and low power is 10 x, so total

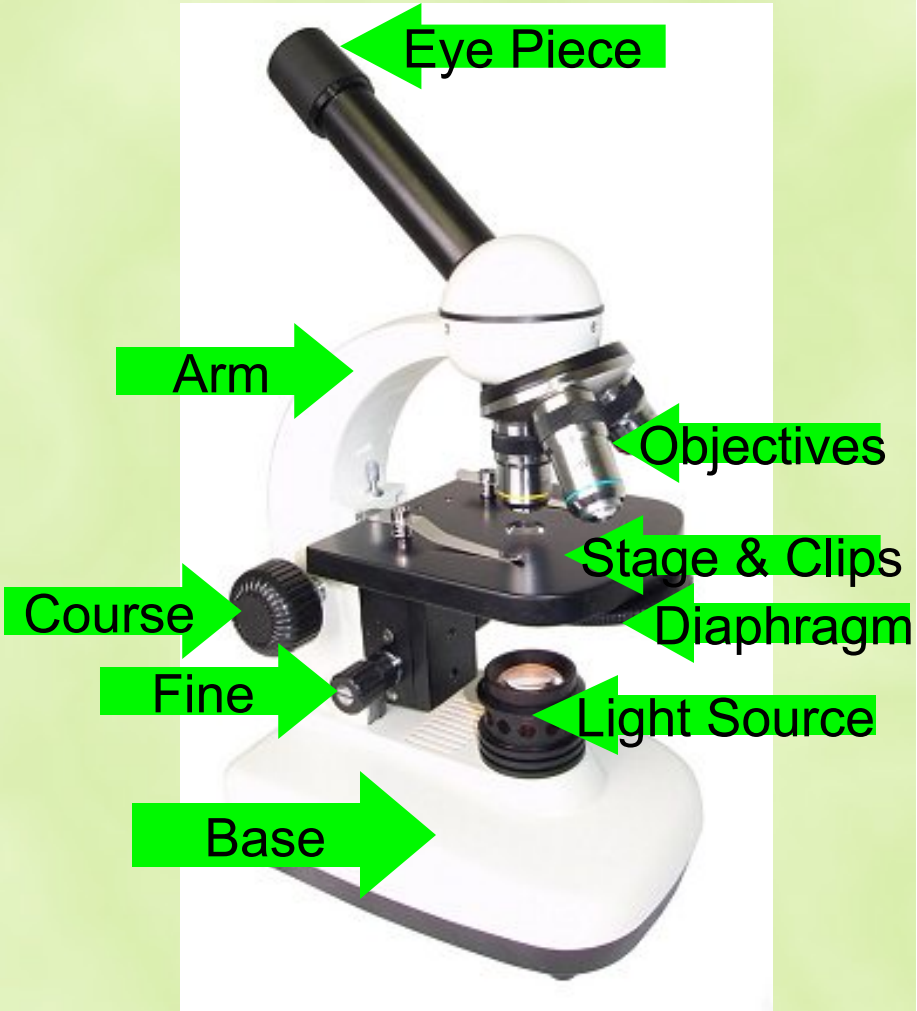
Light

- There are 2 parts to a CLM that control the light.
- Light Source: Usually an electric lamp, the source is directly under the whole in the stage.
- Diaphragm: A disc under the stage that regulates how much light makes it through the stage.
- Controlling the amount of light can effect the clarity of the specimen.



Focus

- There are 2 dials that you use to get a specimen in focus.
- Course Adjustment: This knob moves the stage up and down to get the specimen in the correct position.
- Fine Adjustment: This knob makes very small corrections to fine-tune the view.
- NOTE: The course adjustment know should NEVER be used under high power because it can damage the slide/specimen.



Measurements

- When scientists make measurements they must be able to communicate those measurements to others.
- To do this effectively, scientists must use uniform units of measure.
- The most common system of measurement in the scientific community is the SI or International System of Measurements (often incorrectly called the metric system.)

SI Measurements

- The standard measurements are listed below.
- An additional benefit to using SI measurements is that converting from one measurement to another is simpler because all units are based on a factor of 10x.
- By using SI measurements, you speak the same language as all other scientists.

SI Base Units

Base quantity	Name	Abbreviation
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

Lab Procedures

- The data you get from an experiment is only as valid as the procedures that you use.
- Common errors in lab procedure can have a drastic effect on the outcome.
- REMEMBER, you must control all of the variables in order for you to truly test the variable you are studying.

Common Lab Errors

- Here are some things to avoid:
  - Cross Contamination: If a specimen comes in contact with outside materials then the specimen may no longer work the same way.
  - Mismeasurement: Using incorrect measuring techniques can cause your data to be off, or just plain wrong.
  - Lack of Consistency: Small differences between how trials are conducted can lead to bad data. Do everything the same way each time (its not just WHAT, but HOW.)
  - Lack of Clarity: Many mistakes occur because the experimenter does not know exactly what they are doing, so know it before you do it.

Objectives

- Describe the function of the each of the major parts to a compound light microscope (CLM).
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- Describe how to prepare a wet-mount slide.
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- Describe how to use proper lab techniques and explain why they are important.