## **Unit 1: Cells and Systems**

### Section .1 Observing Living Things



# **Examining Very Small Living Things**

- Microscopes can be used to observe small organisms.
- One of the first microscopes was invented in the late 1600s by Anton van Leeuwenhoek.
- He was able to magnify objects up to <u>250x</u>.





 Robert Hooke constructed a microscope with a <u>lens</u> on either end of a long <u>tube</u>. He studied thin slices of cork and named each subunit, a <u>cell</u>.

# **Types of Microscopes**

#### **Simple Microscope:**

- Single lens
- i.e., magnifying glass
- 10x or 20x magnification



## **Compound Light Microscope:**

- Has 2 or more lenses
- Magnification up to 2000x (most <400x)</li>
- Most common microscope in science classes and in medical laboratories.





#### **Electron Microscopes**

- Powerful microscopes used for scientific research
- Magnification up to 10,000,000x





## **The Compound Light Microscope**

 Together, the eye piece and objective lenses magnify, focus and invert an image.







# **Magnification**

- The eyepiece has a magnification of 10x
- There are 3 objective lenses attached to the rotating nosepiece:
  - Low-power objective lens: 4x
  - Medium-power objective lens: 10x
  - ➢ High-power objective lens: 40x

## **Calculating Magnification**

Eyepiece x objective lens = total magnification

## **Calculate the Total Magnification at:**

Low Power: $10 \times 4 = 40x$ Medium Power: $10 \times 10 = 100x$ High Power: $10 \times 40 = 400x$ 

# **Resolving Power**

- The ability to distinguish between two objects that are close together.
- The human eye has limited resolving power.
- Using a microscope, the resolving power increases as we increase magnification.



## **Resolving Power...**



## **Care of the Microscope**

- Use both hands to carry the microscope. One hand on the arm and one hand supporting the base.
- Always carry your microscope in an upright position.
- Before putting your microscope away, always rotate the low power objective lens over the stage.
- Replace the **dust cover** and roll electrical cord around the **base**.

## **Care of the Microscope**

- Avoid contact with the **lens**. Use lens **paper** to clean the lens.
- When focusing, do not bring objective lens too close to the glass slide on the stage.
- Always adjust the focus on the low power objective lens first, and then change to higher power lenses. Adjust higher power lenses with only the fine focus knob.

# **Field of View**

- The field of view is the circle of light seen through a microscope.
- It is the area of the slide that you can observe.
- Each magnification has a different field of view:

Magnification	Field of view (mm)
40x	4.8 mm
100x	1.78 mm
400x	0.45 mm

 You can use the field of view to calculate an approximate size of the object you are looking at:

## Size = field of view x fraction of field of view

Go to note package for practice

Ex. If your field of view is 4.8 mm (low power) and the object you are looking at takes up ¼ of the field of view, the approximate size is...

Size = field of view x fraction of field taken up

- = 4.8 mm x <sup>1</sup>/<sub>4</sub> (or 0.25)
- = 1.2 mm

# How do you know if something is alive?



# **Characteristics of Living Things**

Living things share 7 common characteristics.

## All living things...

Are made up of <u>cells (unicellular or multicellular)</u>

➤Take in <u>nutrients</u>

need energy (producers or consumers)

Produce wastes

≻Respond to stimuli

≽<u>grow</u>

➢<u>Reproduce</u>



For each of the following, identify a characteristic it shares with living things and characteristic it is missing.

a) burning candle

b) snowball

c) thermometer