The Microscope
Lec-1-
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Tools of the Biologist

2. Microscope

-before microscope, no one knew about microbial world

-Leeuwenhoek perfected lenses

-Must be carried properly at all times

-Very expensive to replace

-We will use light microscopes, block light source and image disappears

Important properties of Microscopes

1. **Magnification**- the power of the microscope to enlarge the image of an object

2. **Resolution**- the power of the microscope to show detail clearly

Compound Light Microscope Parts and Function

1. Ocular (eyepiece)- part you look through

   -contains lenses that contribute to total magnification

   -power of 10x (magnifies 10 times)

Microscope Parts and Function

2. Body tube- hollow tube that keeps the lenses of the ocular and objectives at a set distance

3. Nosepiece- holds objectives

Microscope Parts and Function

4. Objectives- contain lenses that contribute to total magnification

Magnification formula- calculate total magnification

Total mag. = ocular power X objective power

Total Magnification

Ocular	Objective
10x	red 4 = 40x
10x	yellow 10 = 100x
10x	blue 40 = 400x

*microscopes we use are **parfocal**- can switch b/t lenses without much adjusting

**only use lens paper to clean objectives

Microscope Parts and Function

5. Arm- supports body tube

6. Base- supports entire microscope

   (when carrying, keep hand back on base because lamp will be hot!)

7. Stage- tray-like structure that supports specimen/slide over stage opening

Microscope Parts and Function

8. Stage Clips- keep specimen/slide tight against stage

9. Stage Opening- allows light to pass through/around specimen

10. Diaphragm- controls amount of light that reaches your eye

Microscope Parts and Function

11. Light source- provides light to create the image that you see

12. Coarse adjustment- larger knob, that moves 1 of 3 structures (body tube, stage, or nosepiece) and allows for rough focus

Microscope Parts and Function

13. Fine Adjustment- smaller knob, moves the objectives slightly and allows for fine focusing

Microscope Classifications

- Based on how image is created

1. **<u>Light Microscope</u>**

   -uses light to create specimen image

   -lenses are glass or plastic

   -magnification and resolution are good (2,000x)

Benefits of Light Microscopes

- Smaller→ portable
- Cost effective
- Easy specimen prep (live specimens can be used)
- Training simple/ user friendly
- Can see microscopic items

2 Types of Light Microscope

1. Simple- Has one lens

   Ex: magnifying glass, Leeuwenhoek's microscope

2. Compound- Has 2 or more lenses

   Ex: High school Biology microscope

   (more lenses create better image and better resolution)

2. Electron Microscopes

The Cell Theory

Development

1. Leeuwenhoek- First to see living cells
2. Hooke- coined the term cell while viewing cork
3. Lamarck
4. Mohl
5. Meyen

Put out publications that indicated the **cellular nature** of life (None of these men given credit for cell theory)

Cell Theory Scientists

1. Schleiden (German)

   -Botanist

   -determined that all plants and their parts (roots, stems, leaves, etc) are composed of cells– plant cell drawing

Cell Theory Scientists

2. Schwann (German)

   -Zoologist

   -Determined that all animals and their parts are composed of cells (tougher to convince people of this)

Reasons for this:

1. Rounded shape- most “cells” were square
2. No cell wall

Cell Theory Scientists

Animal cell drawing

Reason Schwann was successful was because there was a nucleus present in animal cell as well

Cell Theory Scientists

3. Virchow (German)

   -Doctor

   -determined that all cells come from pre-existing cells

The Cell Theory

1. All living things are composed of cells
2. Cells reproduce or come from pre-existing cells via cell division (mitosis)
3. Cells are the basic units of life **or** cells are the smallest form of life

Possible essay: explain why cells are smallest life forms