Metric Measurement and Microscopes

Honors Biology 1

Metric System Prefixes

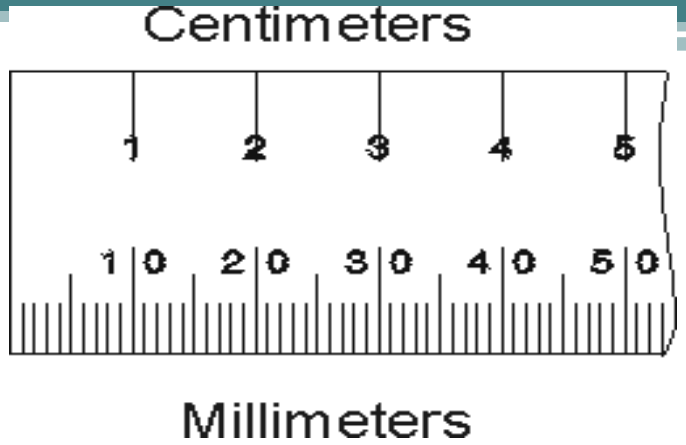
Common Prefixes used with SI Units			
Prefix	Symbol	Meaning	Order of Magnitude
giga-	G	1 000 000 000	10^{9}
mega-	M	1 000 000	10^{6}
kilo-	k	1 000	10^{3}
hecto-	h	100	10^{2}
deka-	da	10	10^{1}
	base unit	1	10^{0}
deci-	d	0.1	10^{-1}
centi-	c	0.01	10^{-2}
milli-	m	0.001	10^{-3}
micro-	μ	0.000 001	10^{-6}
nano-	n	0.000 000 001	10^{-9}

SI (system international vs. the Metric System

Measurement	SI Base Unit	Metric
Length	meter	meter
Mass	kilogram	gram
Temperature	kelvin	Celsius

- In all measurements, estimate one place value

Length



- Meter (m)
- CONVERSIONS
- 1 m = _____cm

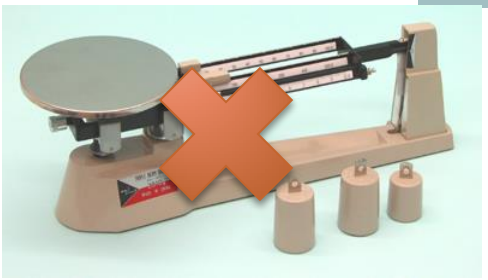
$$1\text{ m} \times \frac{100\text{cm}}{1\text{ m}} = 100\text{ cm}$$

124 mm = _____km =

$$124\text{mm} \times \frac{1\text{ m}}{1000\text{mm}} \times \frac{1\text{ km}}{1000\text{m}} = .000124\text{km}$$

$$= 124\text{mm} \times \frac{1\text{km}}{10^6\text{ mm}} = .000124\text{km}$$

Mass

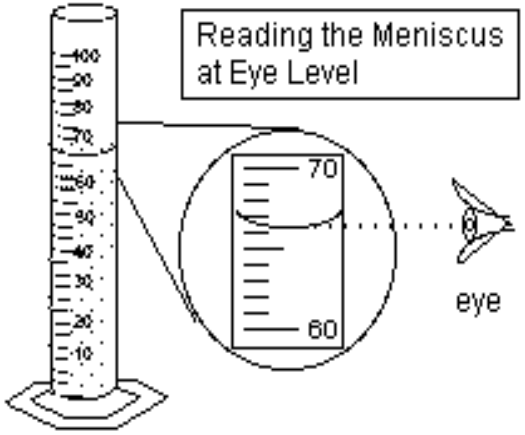


- Measured with a balance
- Grams (g)
- Mass vs. weight
  - Mass = the amount of matter in an object
    - Same on earth, moon, sun, etc.
  - Weight = mass x acceleration of gravity
    - Changes

    - They are used interchangeably because in biology almost all measurements are on the Earth (gravity is nearly constant)

Volume

- Liter (L)
- Measured with a graduated cylinder
- Curved line = meniscus = caused by adhesion (water sticking to the side) and cohesion (water sticking to water)



Temperature

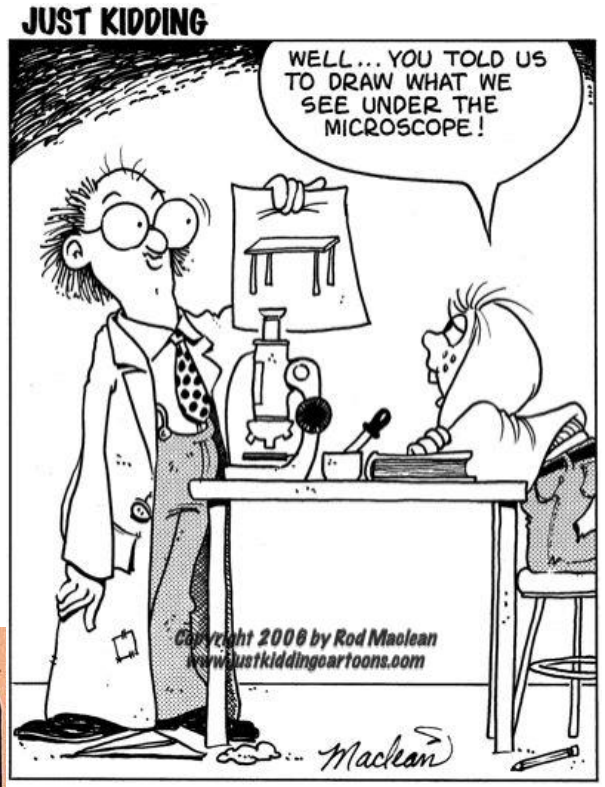
- Celcius C
- Freezing = 0 Boiling = 100

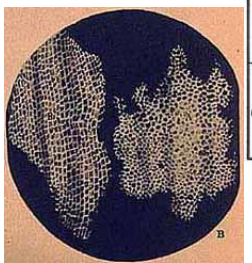
- Conversions (We usually use Celcius in biology – you will use Kelvin in Chemistry!)

- °F = 1.8 (°C) + 32 °C = $\frac{(°F - 32)}{1.8}$
-
- °C = K - 273

The History of the Microscope

- 1595 – Zacharias Jensen – 1st Compound microscope???
- **Anton van Leeuwenhoek** (1632-1732) invented a simple microscope with better lenses 200x magnification (could see cells – bacteria, muscle cells, sperm, etc.)
- **Robert Hooke** (1635-1703) discovered plant cells, added a stage, course/fine focus





Microscopes

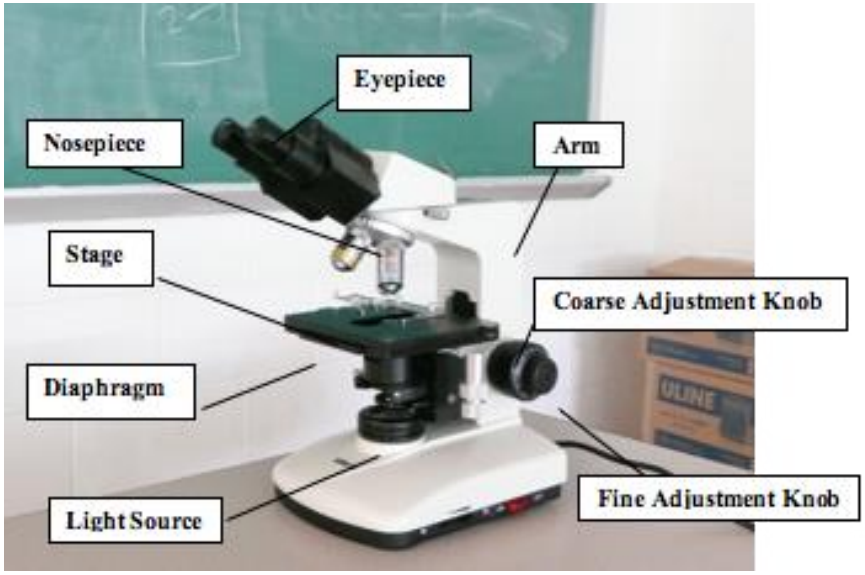
- Types of microscopes we will use in Honors Biology
  - Compound
    - 2 lenses – one in the eyepiece (10x) and one on the nosepiece
    - Light must pass through the sample
    - See 1 small "slice"

  - Stereoscope (Dissecting Scope)
    - Used to see larger objects
    - Can magnify opaque objects

Parts of a Compound Microscope

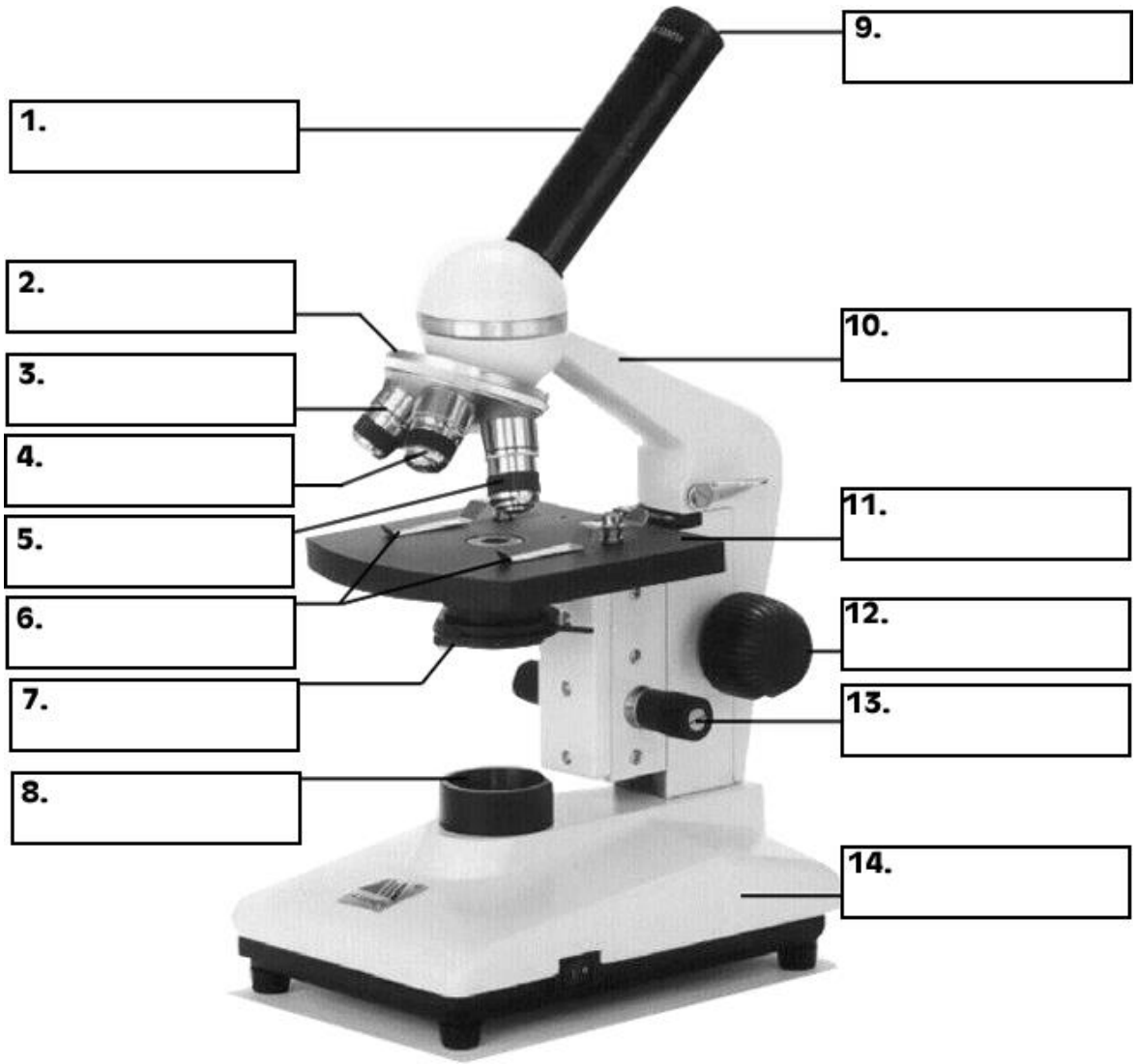
Monocular

Binocular

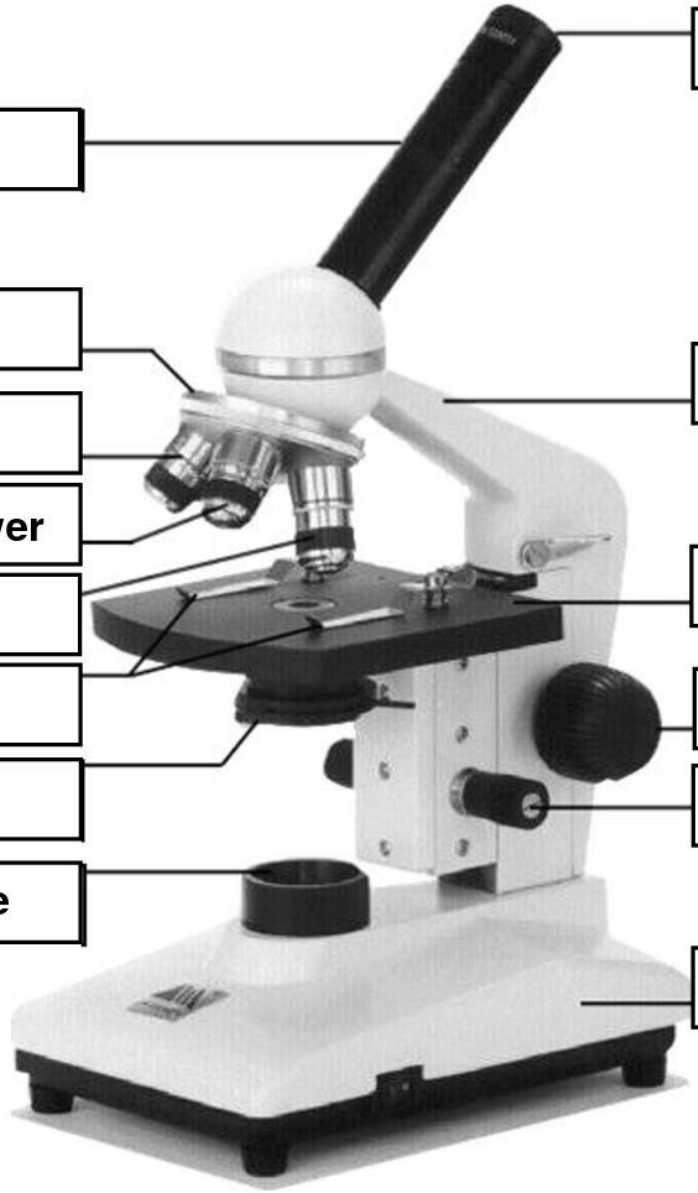


Microscope Review

- Microscope Review Quiz



let's Review!

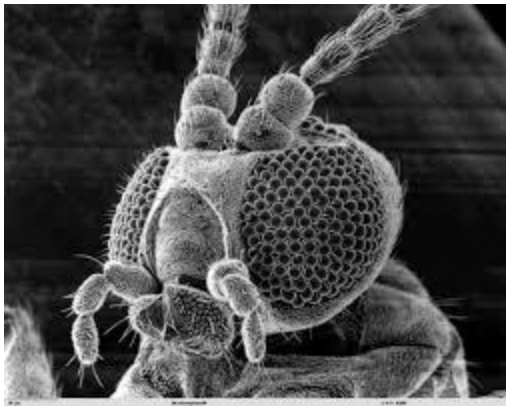


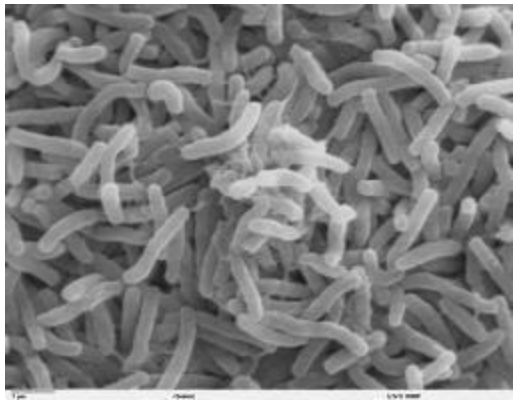
1. Body tube
2. Nosepiece
3. Low power
4. Medium power
5. High power
6. Stage clips
7. Diaphragm
8. Light source
9. Eyepiece
10. Arm
11. Stage
12. Coarse adjustment
13. Fine adjustment
14. Base

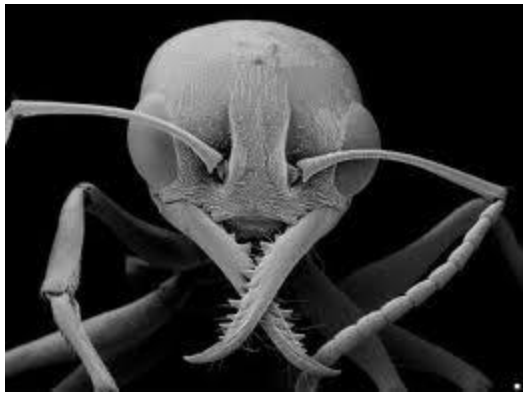
Animated by Jeff Christopherson

SEM and TEM

- Scanning Electron Microscopes and Transmission Electron Microscopes
  - Use electrons instead of light to form image
  - SEM Image Gallery Black and White
  - Colored SEM pictures







Measuring with a microscope