

Question of the Day

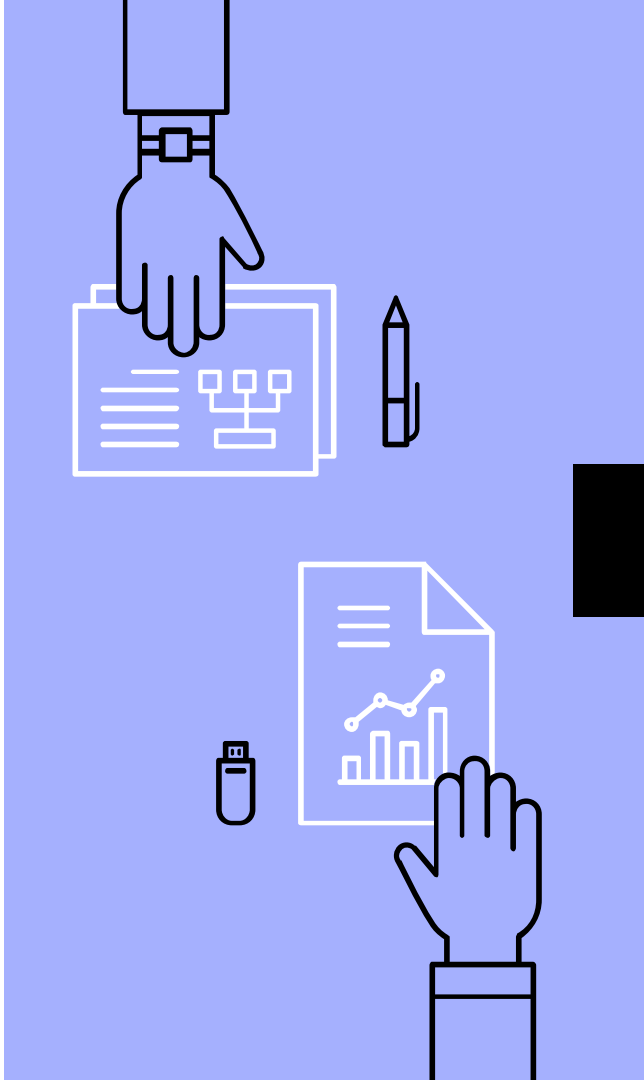
What comes first, the cereal or the milk?



Intro

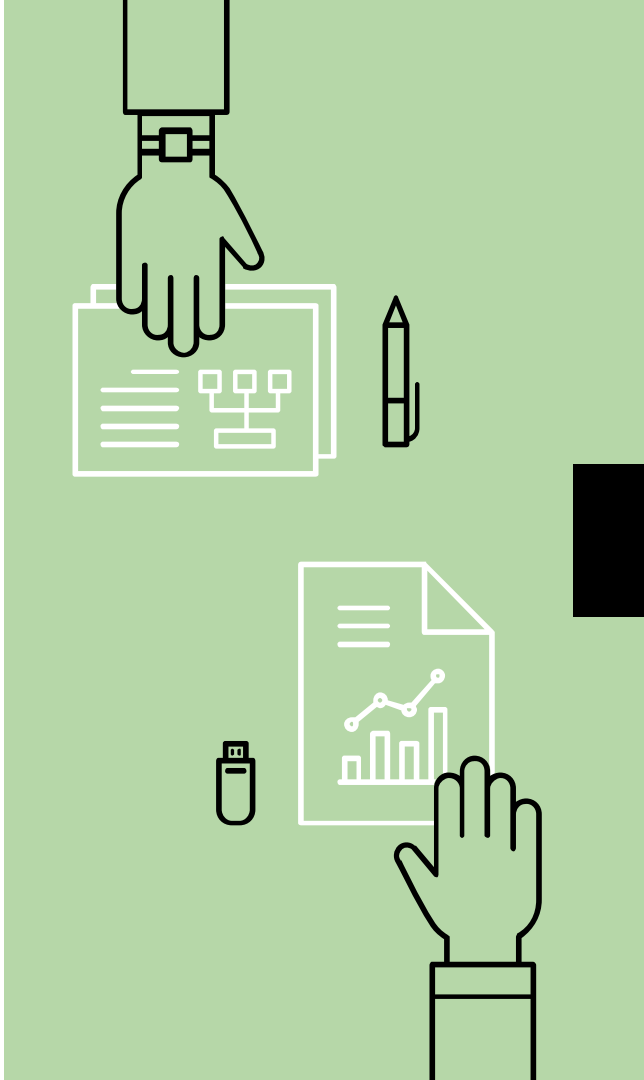
What we'll learn today:

- Quick Intro to our Challenge!
- Science Olympiad "Bio Process" overview
  - Rules
  - Specific questions
- CRISPR
  - Ethical debate on designer babies (gene editing)



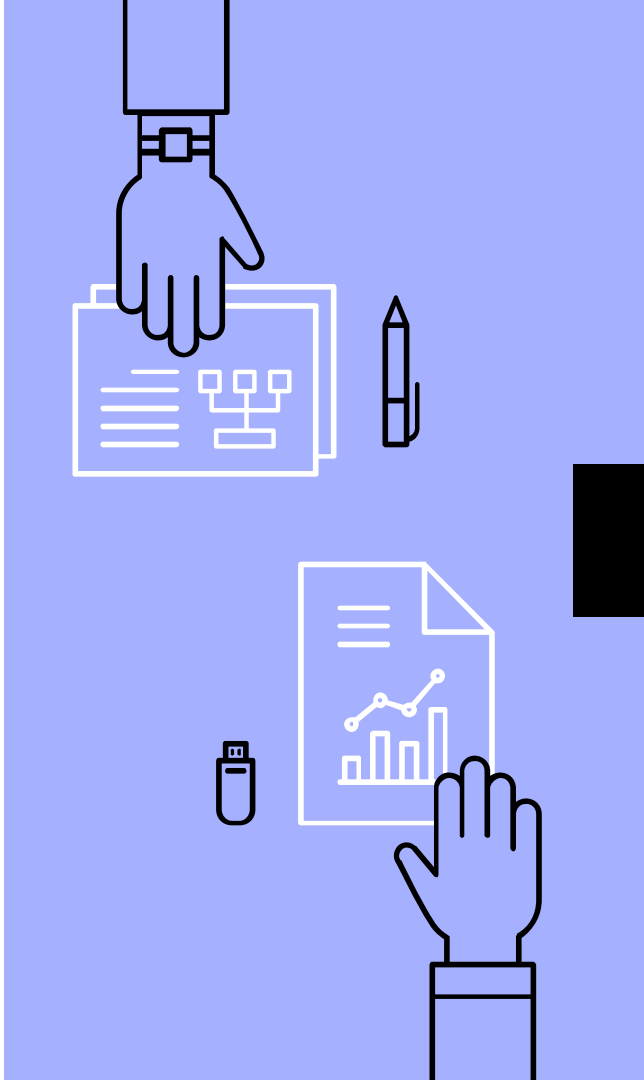
Behavioral Biology Challenge (aka Psychology Research Study)

- Record a video, take pictures or notes of an animal behavior near you
- Hypothesis using Tinbergen's 4 Levels of Analysis
- Design experimental procedure
  - But no need to actually do the experiment… so you can be creative!



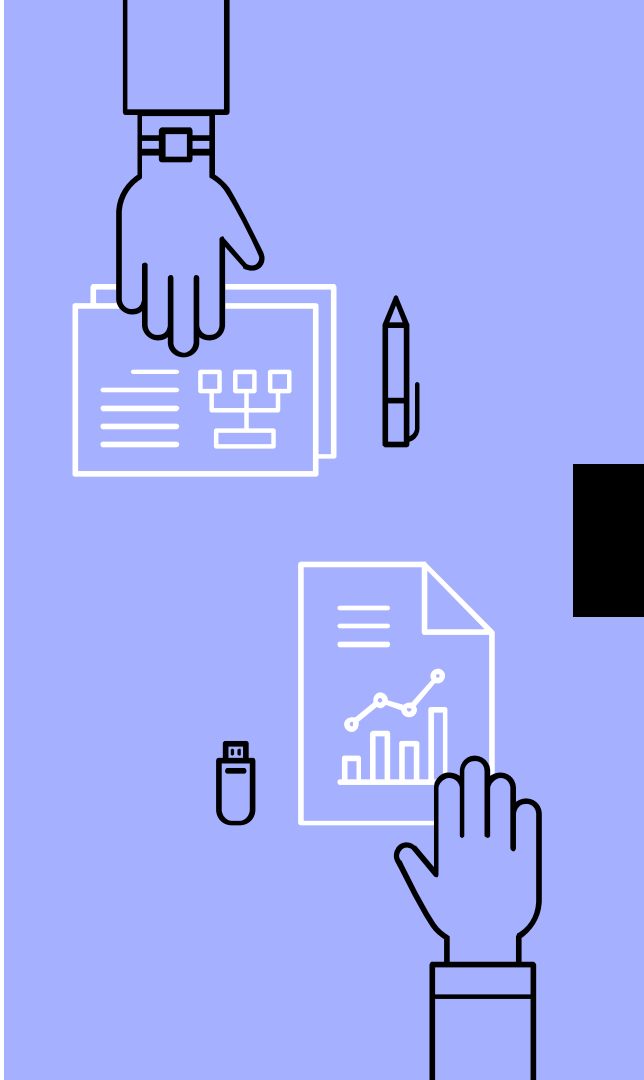
Overview of Div B Bio Process

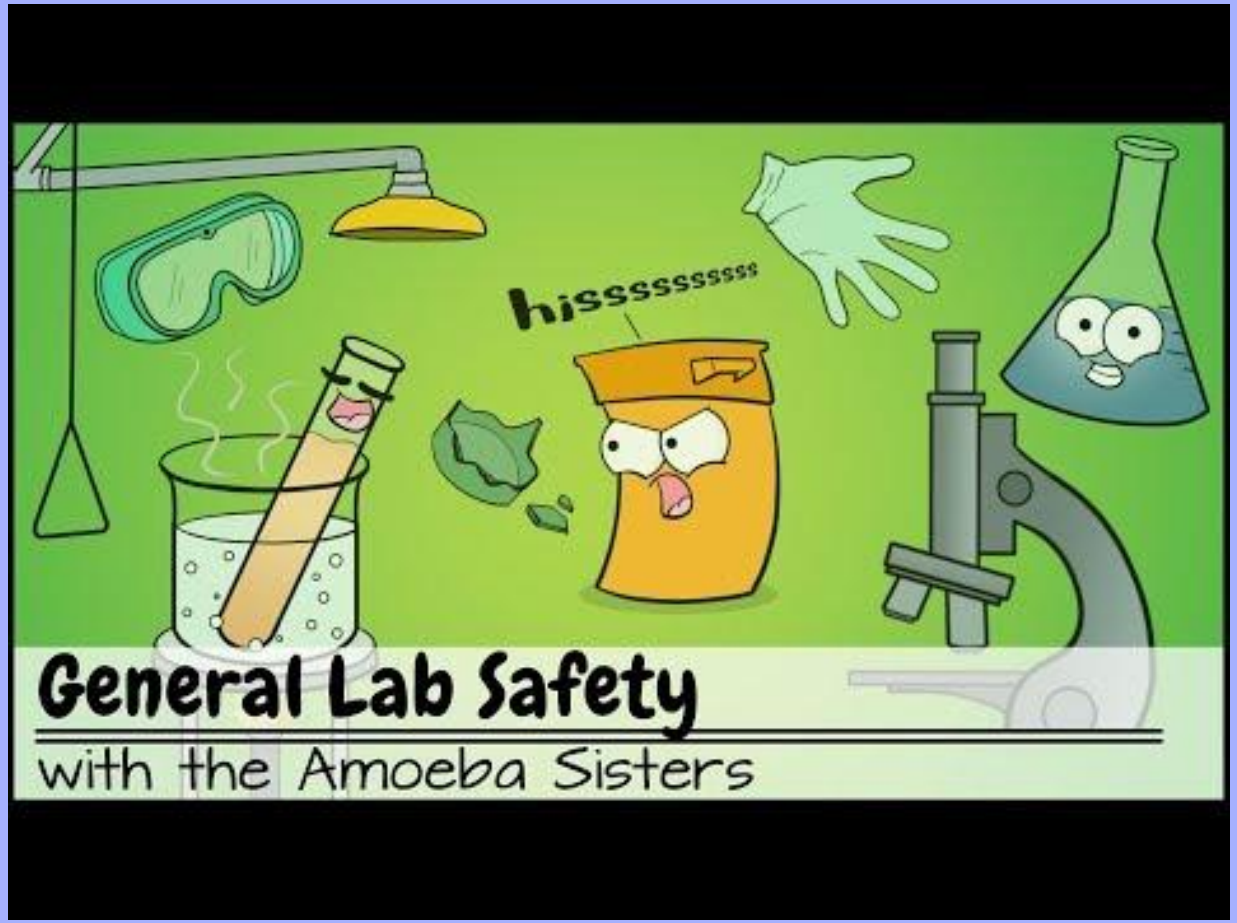
- Biology
- Scientific method
- Using lab equipment



Div B Bio Process Rules

- Z87 chemical splash goggles required
- Calculator encouraged (non-programmable)
- Each team allowed 1 note sheet
- Uses scientific processes & skills to complete biology related questions & tasks





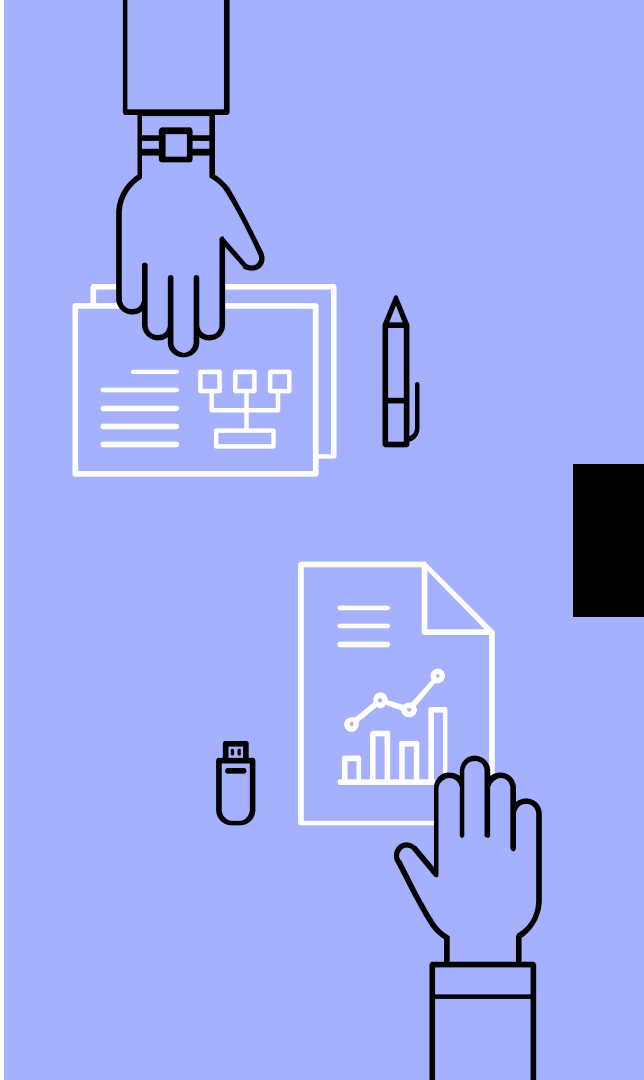
Q1: General Lab Safety

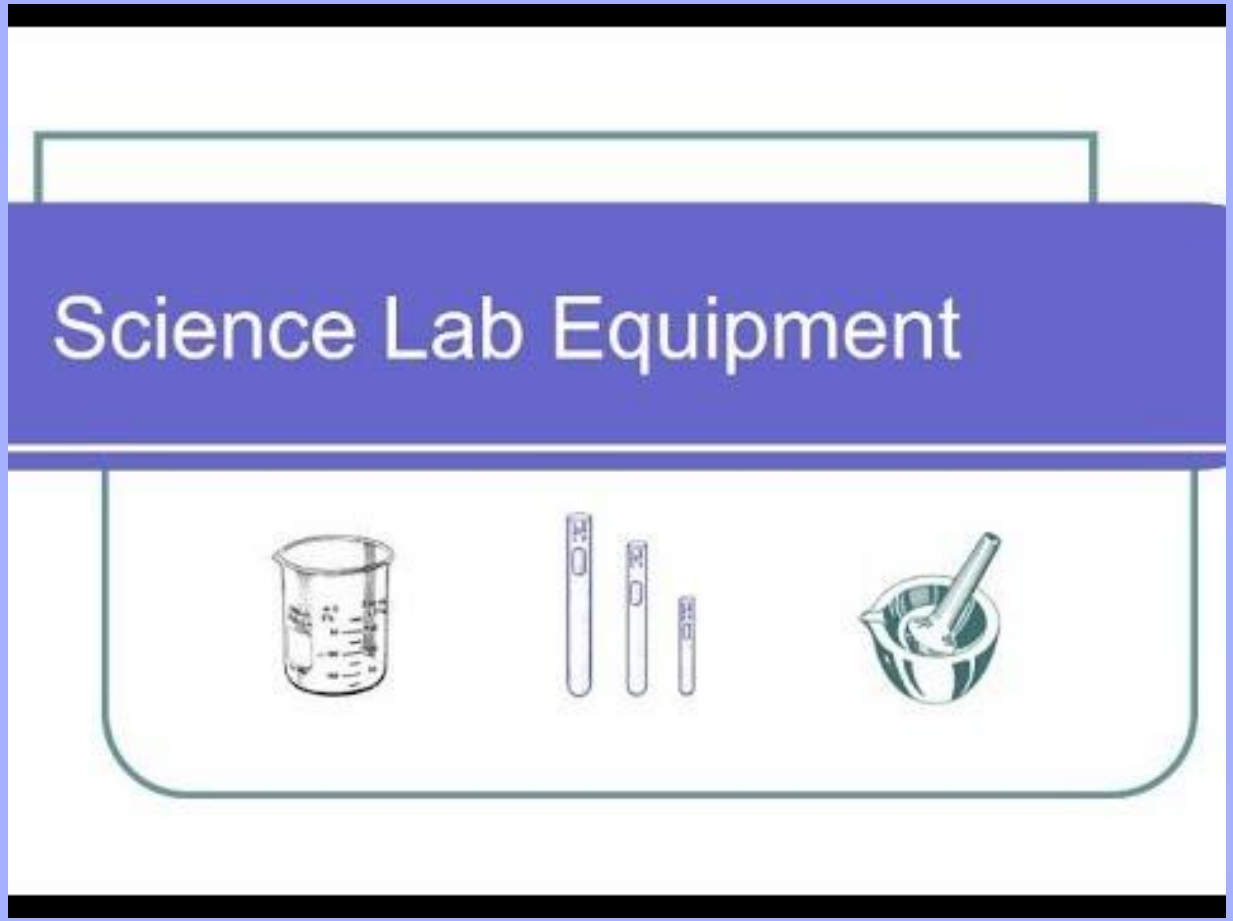
Q2: Relevant Lab Equipment

Microscopy

Other lab equipment

How to use the equipment (ex- how to use a bunsen burner and what is it, the types of balances, etc.)

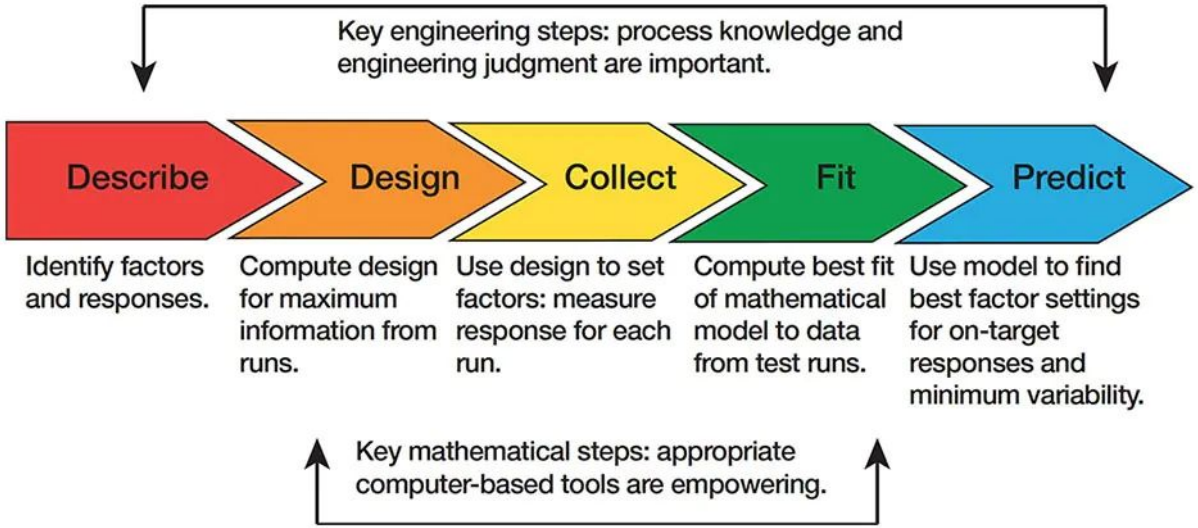


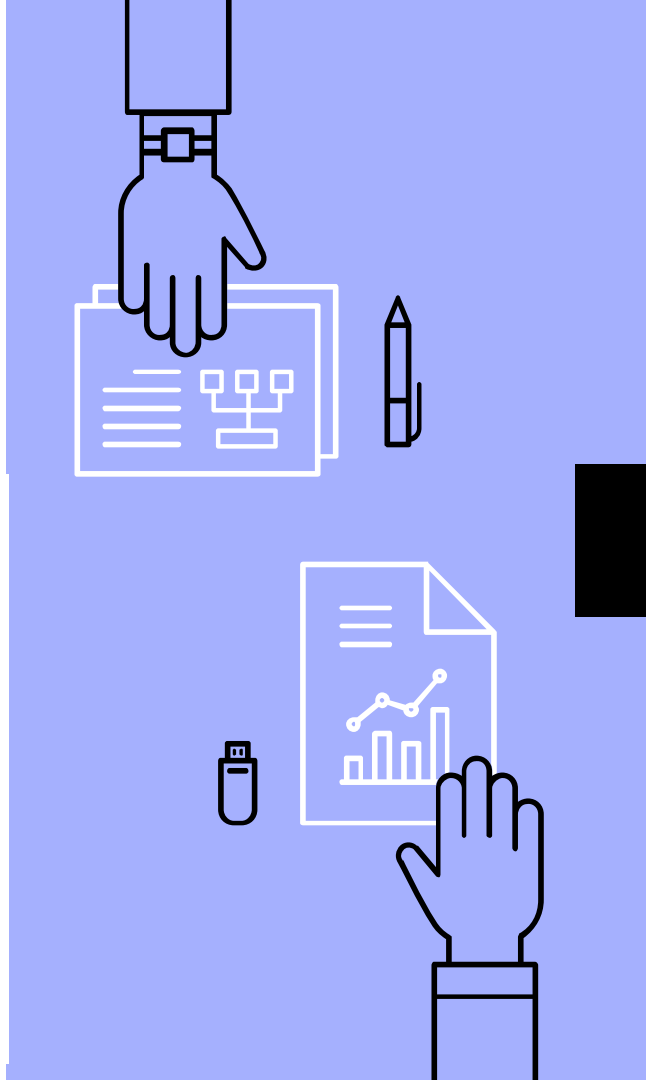


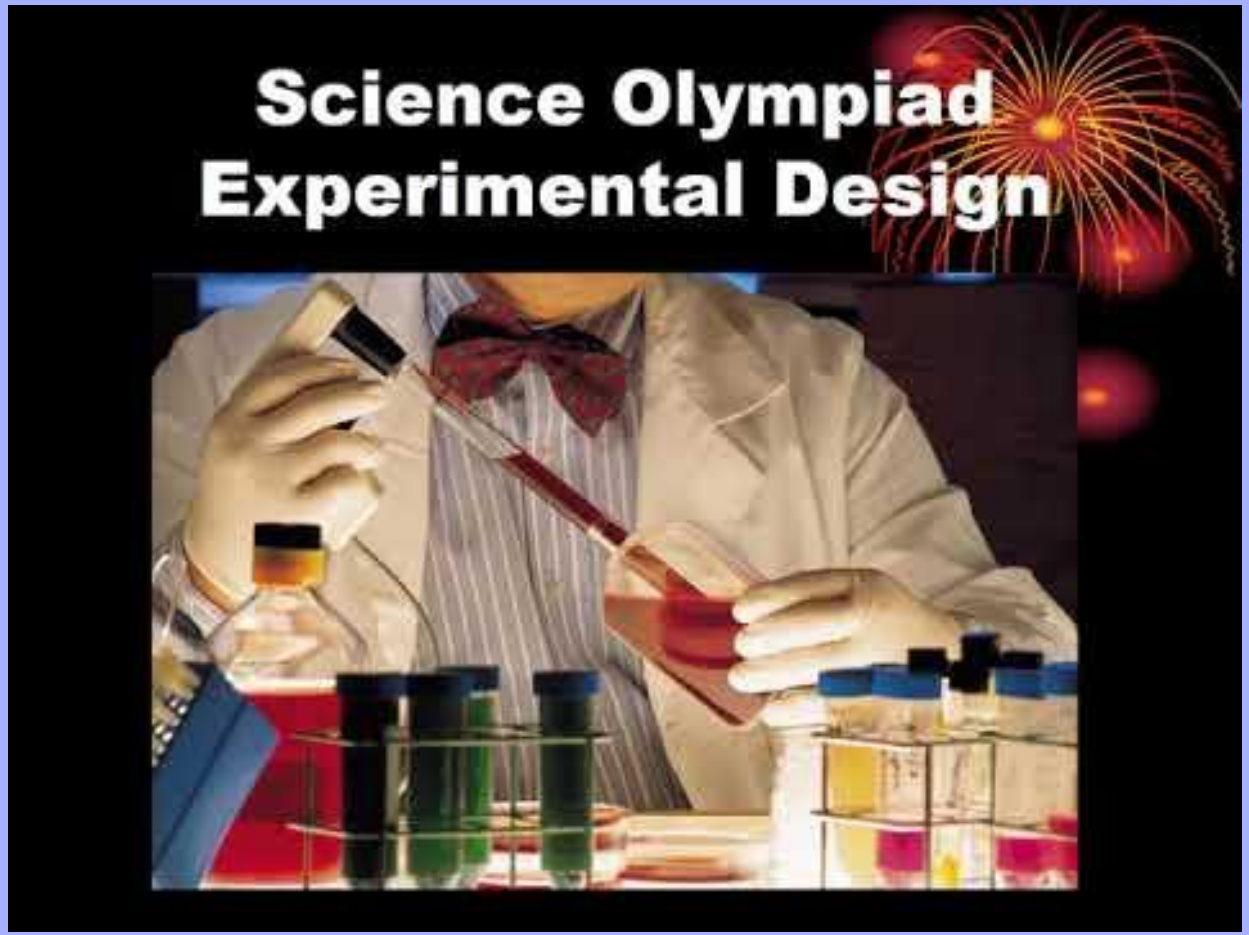
General Lab Equipment

Q3: Experimental Design & Analysis

"Experimental design is the process of carrying out research in an objective and controlled fashion so that precision is maximized and specific conclusions can be drawn regarding a hypothesis statement. Generally, the purpose is to establish the effect that a factor or independent variable has on a dependent variable."



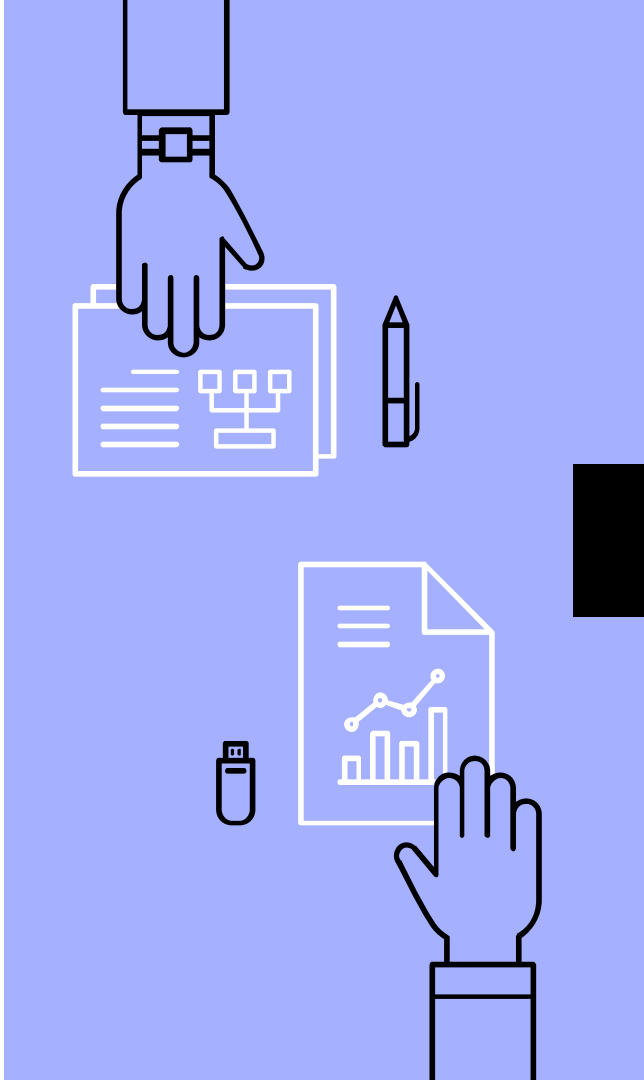




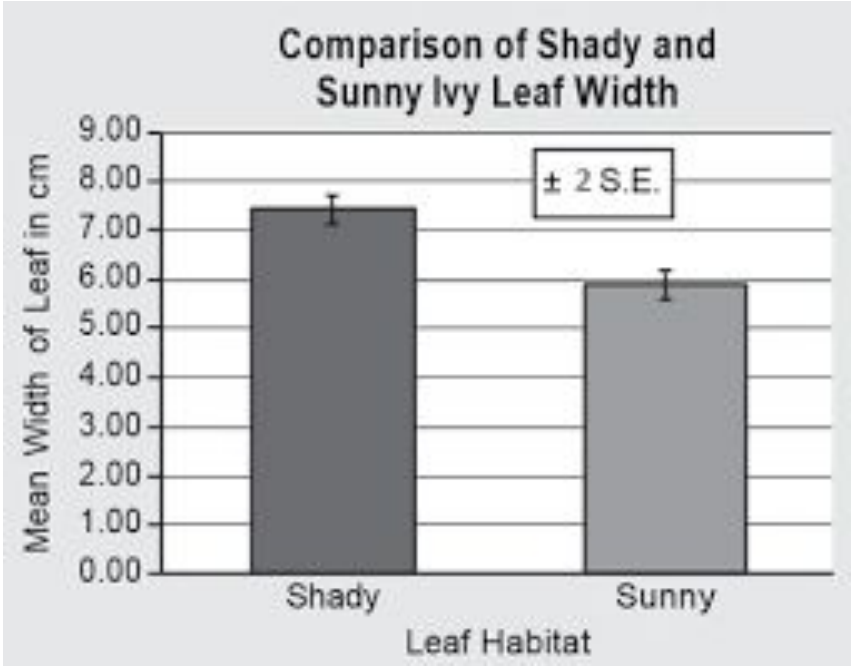
Experimental Design Overview Video

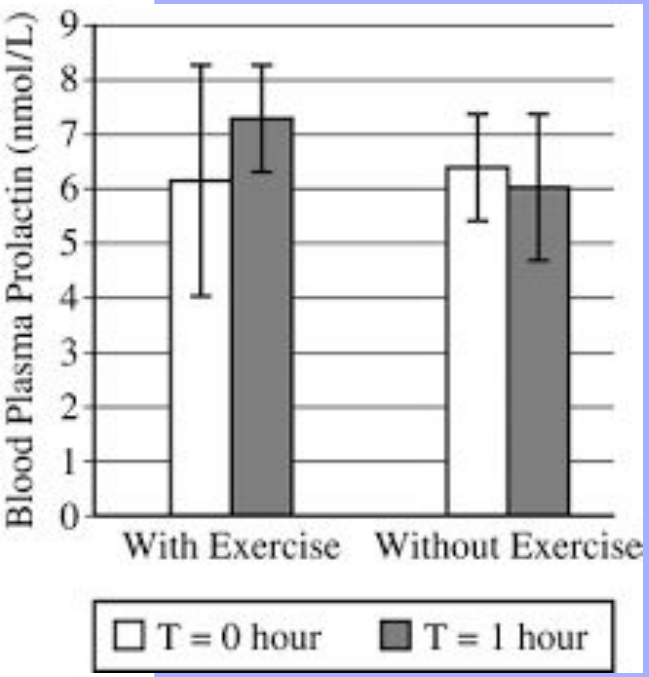
Bonus Q:
Math Portion of Bio Process

- Population density
- Ecological analysis
- Metric & customary conversions
- Interpret graphs



Graphs


Comparison of Shady and Sunny Ivy Leaf Width
± 2 S.E.
Mean Width of Leaf in cm
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Shady
Sunny
Leaf Habitat


Blood Plasma Prolactin (nmol/L)
9
8
7
6
5
4
3
2
1
0
With Exercise
Without Exercise
T = 0 hour
T = 1 hour

Population Density

Rate and Growth

Rate

$$\frac{dY}{dt}$$

Population Growth

$$\frac{dN}{dt} = B - D$$

Exponential Growth

$$\frac{dN}{dt} = r_{max} N$$

Logistic Growth

$$\frac{dN}{dt} = r_{max} N \left(\frac{K - N}{K} \right)$$

dY = amount of change

dt = change in time

B = birth rate

D = death rate

N = population size

K = carrying capacity

r_{max} = maximum per capita growth rate of population

Metric & Customary Conversions

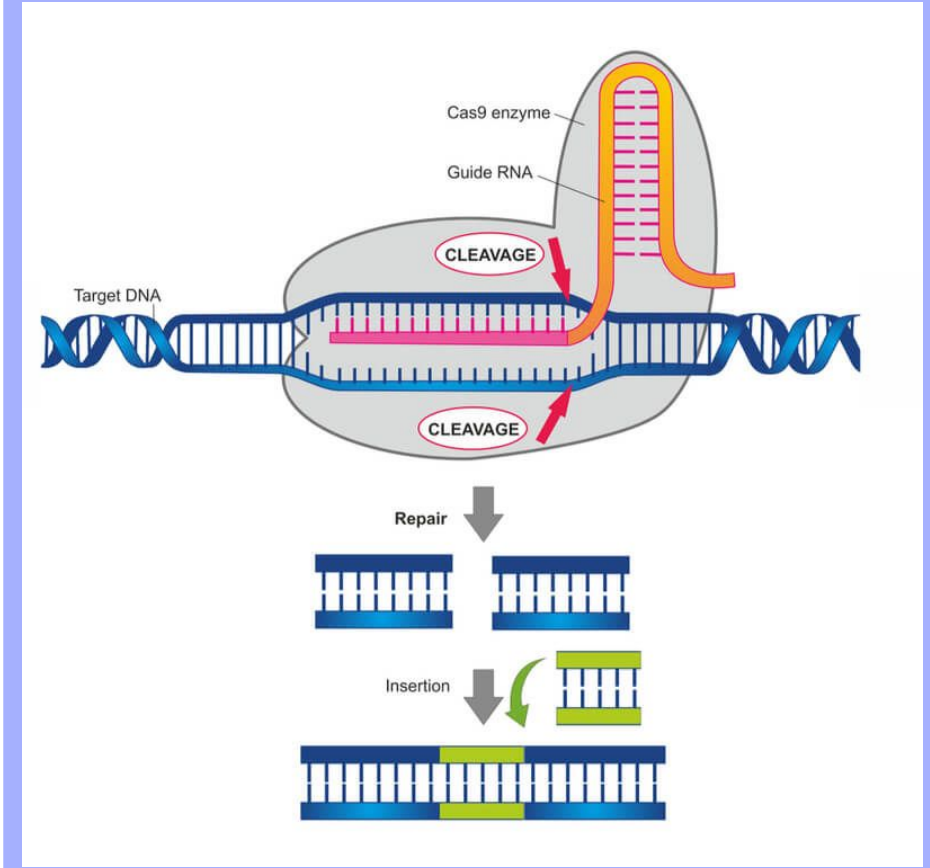


CRISPR-Cas9

(a forgotten gem from Wednesday)

CRISPR-Cas9 is a unique technology that enables geneticists and medical researchers to edit parts of the genome by removing, adding or altering sections of the DNA sequence.

It is currently the simplest, most versatile and precise method of genetic manipulation and is therefore causing a buzz in the science world!



Cool video!

http://www.crisprtx.com/gene-editing/crispr-cas9

CRISPR-Cas9 debate scenario:

In a hypothetical future, it has been several years since the CRISPR-Cas9 technology was first introduced.

A biomedical company has proposed the idea of gene editing in unborn babies when they are first fertilized in vitro to screen for potential genetically determined diseases (such as cystic fibrosis or muscular dystrophy and many others) that can have devastating consequences. The company argues that these harmful genes can be removed via CRISPR-Cas9.

This sounds great, however some parents have started to ask scientists to edit their baby's genome to select for a certain hair color, certain athletic qualities, certain intellectual qualities, etc. and now the prospect of eliminating genetically determined diseases must be weighed against the ethical manner of designing one's own babies & selecting genes that may determine the infant's future!

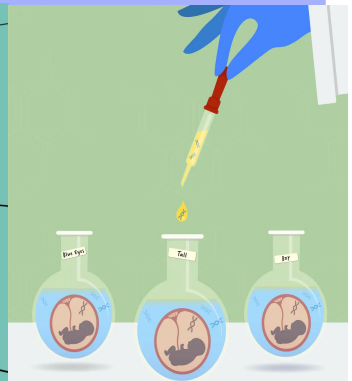
Question to debate on: Is gene editing ethical?









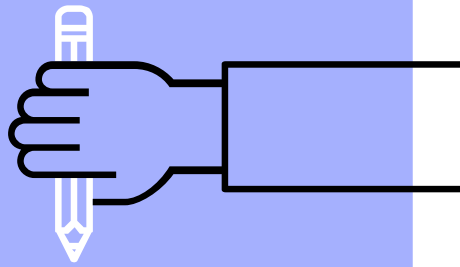


To be continued...

Next class:

- Botany & Biochemical Applications
  - Plants are NOT always boring!
  - Plants are NECESSARY for many pharmaceuticals and other medical purposes that are used in society today (such as aspirin & chemo)





End of Day 6

Any questions?
Please ask away!

