

Common Lab Measurement Tools:

- A graduated cylinder is used for precise mL measurements
- A beaker is used for \_\_\_\_\_ measurements
- A meter stick with cm/mm is used for precise short lengths

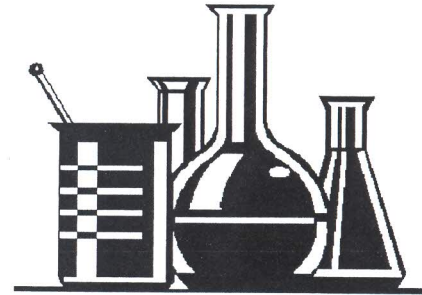
Experimental Design

Independent Variable

- What "I" set up (\_\_\_\_\_)
- Always plotted on the X-axis

Dependent Variable

- What "I" measure (data/result)
- Always plotted on the Y-axis



Practice Problem 1: Use the graph to the right →

- What is the IV of this experiment?

average rainfall

- In what unit is the IV measured?

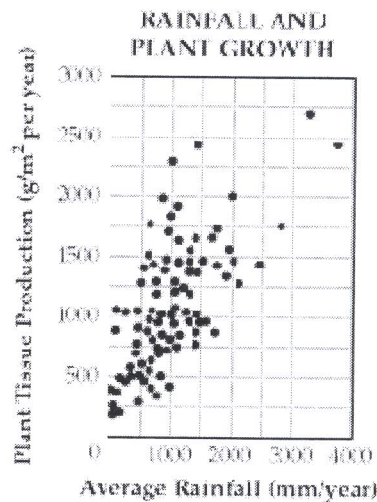
mm/year

- What is the DV of this experiment?

plant + tissue production

- In what unit is the DV measured?

g/m<sup>2</sup> per year



Practice Problem 2: Use the data table to the right →

- What is the IV of this experiment?

Water + temperature

- What is the DV of this experiment?

breathing rate

- Can you think of three **constants** that would be appropriate?

1. species of fish
2. time
3. number of fish

BREATHING RATES OF GOLDFISH

Trial	Water Temperature				
	26°C	20°C	14°C	8°C	2°C
1	101	80	54	30	2
2	98	75	52	27	3
3	102	81	53	29	2
4	103	78	55	28	4

- Based upon the data table, what **question** do you think this experiment was trying to answer? Explain...

How does water temperature affect the breathing rates of goldfish?

### Practice Problem 3

The table below shows the number of species of different types of simple land plants.

NUMBER OF  
SIMPLE PLANT SPECIES

Simple Plants	Number of Species
Bryophytes	20,000
Club mosses, spike mosses, and horsetails	1,000
Ferns	12,000
Total	33,000

$$\frac{20,000}{33,000} = \frac{20}{33}$$

$$\frac{20}{33} \approx \frac{20}{30} = \frac{2}{3}$$

According to the table, approximately what proportion of all simple plant species are bryophytes?

- A 1/3
- B 1/2
- C 2/3**
- D 3/4

### Bias

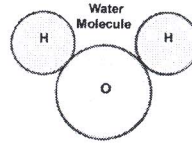
- Placebo = **sugar pill** – It is identical in shape, size, and color to medication but it contains no medicine.
- **Unintentional**
  - May be the result of not setting up enough test subjects OR forgetting to set up a control group
- **Intentional**
  - Purposely skewing data, omitting trials, or changing test results
  - Usually done to make your data appear correct

## Important Properties of Water

- High Heat Capacity: Allows for temperature homeostasis in living things and keeps bodies of water at a relatively stable temperature
- Polarity: Causes cohesion of water molecules and adhesion of water to other substances
- High Surface Tension: Gives small insects the ability to "walk" across water/due to cohesion
- Universal Solvent: Many substances are able to dissolve in to water forming solutions.
  - Example: Fluoride dissolves into drinking water because it is attracted to polar water molecules

## Water and pH

- Water is neutral with a pH of 7.
- All substances **below 7** = acid
- All substances **above 7** = base
- The further from 7 a substance is, the stronger it is considered on the pH scale



## Inorganic Vs. Organic

- Inorganic = no carbon  
Water and minerals are inorganic
- Organic = containing carbon bonded to hydrogen and oxygen  
lipids, carbs, proteins, nucleic acids, and vitamins are organic

## Building Blocks

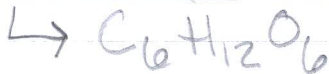
- Carbohydrates... monosaccharides
- Lipids... fatty acids & glycerol
- Proteins... amino acids
- Nucleic Acids... nucleotides

## Important Examples

1. Carbohydrates = Quick energy source!!!

CELLULOSE: source of dietary fiber/makes up cell wall in plants and bacteria

Glucose: molecule created during photosynthesis





2. Lipids = long-term energy storage

FATS, WAXES, OILS

PHOSPHOLIPIDS: makes up cell membrane for all organisms

3. Proteins: Raw materials for structure

ENZYMES: Special proteins that catalyze important metabolic activities/chemical reactions  
-Enzyme reactions keep our **metabolic activity** functioning properly

### Factors Affecting Enzyme Function

#### Temperature

- Low temps slow down enzyme function
- As temperature increases, enzyme function first increases, then stops (denatures)

#### pH

- Too high OR too low from optimal range destroys enzymes
- Remember: Denatured enzymes are permanently deformed

4. Nucleic Acids: Storage and transport of genetic information

DNA: Holds genetic information; double stranded

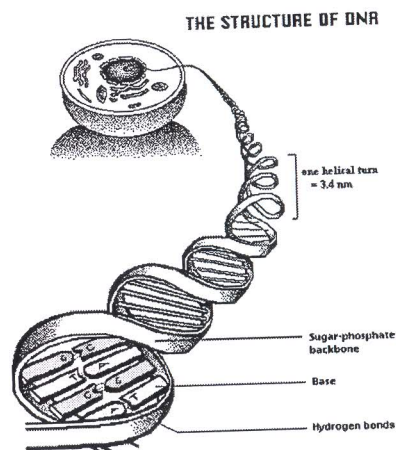
RNA: single stranded

5. Vitamins

D - bones  
C - healing  
K - blood-clotting

6. Minerals: aids in cellular  
processes

ex: iron  
calcium  
potassium



## Organelles and Cell Function

1. What is a prokaryote?

- no nucleus ex: bacteria
- no membrane bound organelles

2. What is a eukaryote?

- has a nucleus ex: plants & animals
- has many membrane bound organelles

Define the organelle and list if they are found in Animal cells (A), plant cells (P), Bacteria (B), or all cells (ALL)

3. Cell membrane:

ALL

- controls what enters and exits the cell

4. Cytoplasm:

ALL

- jelly like fluid that fills the cell

5. Ribosome:

ALL

- assembles the amino acids into a protein

6. Cell Wall:

P

- gives rigid structure to the plant cell

7. Flagella:

B, A

- whip like tail for movement

8. Cilia:

B, A

- small hair-like for movement

9. Pseudopodia:

A

- cytoplasmic extensions used for movement & food

10. Nucleus:

P, A

11. Mitochondria: P, A - makes energy (ATP) by cellular respiration

12. Chloroplast:

P

- makes food (glucose) for plants by photosynthesis